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Meat...

and the Weight Reduction Diet in Cardiac Disease

The important relationship between obesity and the outlook in cardiac disease and hypertension is vividly emphasized in a recent publication of The American Heart Association.*

For reasons not entirely understood at present, "heart disease and high blood pressure are more common in overweight persons than in those of desirable weight." The predisposition to atherosclerosis in obesity and the increased physical burden of carrying excess weight are undoubtedly contributing factors. Hence, as this publication points out, weight reduction is the first line of defense in decreasing the incidence of cardiac disease, and in improving the prognosis after cardiac disease or hypertension has developed.

Meat occupies a prominent position in the weight reduction diets outlined in this American Heart Association booklet. This recommendation is in sharp contrast to the erroneous belief held in former years that meat is harmful in hypertension or cardiac disease. "There is no evidence that red meat or any other form of protein in moderation has any adverse influence on blood pressure."

The magic formula for reducing is simply "Eat lean." Two types of diets are outlined. One "allows moderate amounts of meat and other proteins, small amounts of fat and moderate amounts of carbohydrates." The other is "high in protein with plenty of meat, eggs and cheese, moderate in fat and low in carbohydrates." Diet No. 1 provides 70 Gm. of protein, 60 Gm. of fat, and 120 Gm. of carbohydrate; caloric yield, 1,300. Diet No. 2 provides 100 Gm. of protein, 80 Gm. of fat, and 60 Gm. of carbohydrate; caloric yield, 1,360.

The inclusion of generous amounts of meat in these diets—12 to 16 ounces of cooked meat or two substantial servings each day in Diet No. 2—is a reflection of the important role meat plays in any weight reduction regimen. It is generously included because of its high content of protein of excellent biologic value and because lean meat contains unobjectionably small amounts of fat.

*"Food For Your Heart, a Manual for Patient and Physician, Department of Nutrition, Harvard School of Public Health, Harvard University, The American Heart Association, Inc., New York, 1952. Copies available through local Heart Association.

The Seal of Acceptance denotes that the nutritional statements made in this advertisement are acceptable to the Council on Foods and Nutrition of the American Medical Association.

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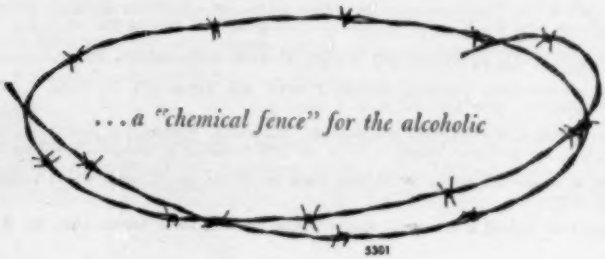

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and THE NATION'S HEALTH

Official Monthly Publication of the American Public Health Association, Inc.

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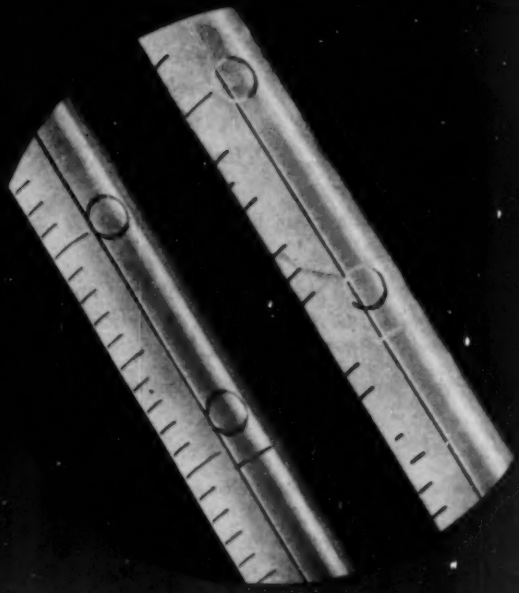

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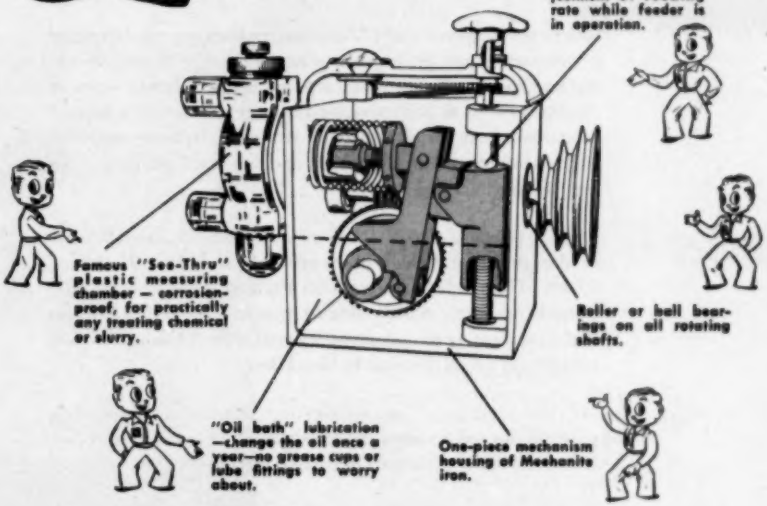
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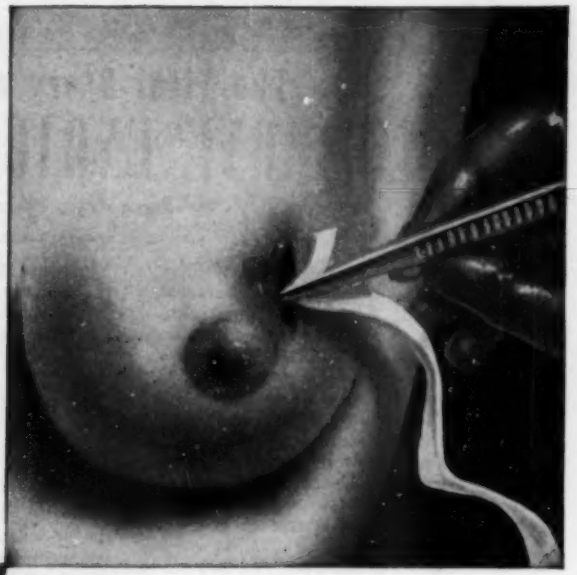
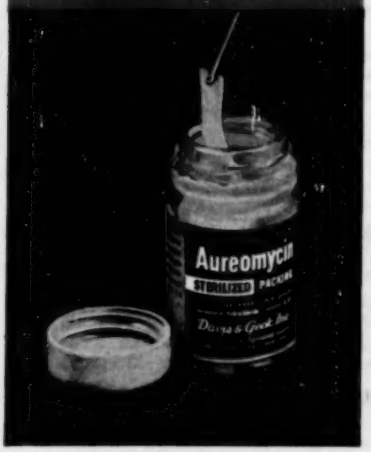
1. Marchisello, P. J., Prigot, Aaron, and Wright, L. T.: Am. Jour. Surg., Dec., 1952.





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The Vital Story of MACARONI* ENRICHMENT

by Science Writer

This is the fourth article in a series devoted to the story of cereal enrichment

Dramatic results have been recorded about the value of enrichment in improving health. From the United States, the Bataan peninsula in the Philippines, Newfoundland and many other parts of the world comes word of the great benefits which result from enrichment.

For years, some forward-looking manufacturers of macaroni and noodle products have used enrichment to make their good foods better. They know that enrichment restores important vitamin and mineral values which are unavoidably lost in milling, and they recognize their responsibility to provide the greatest health-building benefits for the public.

Enrichment is really a simple process. It adds the following essential elements to the food during manufacture.

Thiamine—also called vitamin B_1. This vitamin helps to build physical and mental health. It is essential for normal appetite, intestinal activity and sound nerves.

Riboflavin—also called vitamin B_2. This vitamin helps to keep body tissues healthy and to maintain proper function of the eyes. It is essential for growth.

Niacin—another "B" vitamin, is needed for healthy body tissues. Its use in the American diet has done much to make a serious disease called pellagra disappear.

Iron—is a mineral used in all enrichment. It is essential for making good, red blood and preventing nutritional anemia.

Products made from semolina may be enriched by two methods. One uses small square wafers which contain all the vitamins and iron necessary to enrich 100 lbs. The wafers break up in a small amount of water which is then added to the paste. For manufacturers who use the continuous press method, a powdered concentrate of the vitamins and iron, called a premix, is available. This is added by a mechanical feeding device.

**Macaroni it used here in the generic sense. It includes all alimentary pastes: macaroni, spaghetti, pastina, noodles.*

These are the minimum and maximum levels, in milligrams per pound, required by the Federal Definitions and Standards of Identity for enriched alimentary pastes.

	Min.	*Max.*
Thiamine (vitamin B_1)	4.0	5.0
Riboflavin (vitamin B_2)	1.7	2.3
Niacin	27.0	34.0
Iron	13.0	16.5

NOTE: These levels allow for 30% to 50% losses in kitchen procedures.

Nowadays scientists are able to "build" duplicates of many of Nature's essential complexes in the laboratory. This has happened with many vitamins. First the chemical composition is learned and the pure substance is isolated. Then a "duplicate" is made which is identical chemically and biologically with Nature's product. A vitamin is a vitamin regardless of its source just as salt is salt whether it comes from a mine or is evaporated from the sea. So efficient is large scale manufacturing that vitamins are sold at a lower cost than if they were extracted from natural sources.

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The combination of scientific research, thorough know-how and mammoth manufacturing processes—plus the far-sightedness of leaders in the macaroni industry—is helping vitally to make good macaroni products better.

This article, reprints of which are available without charge, is published as a service to the macaroni industry by the Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey. In Canada: Hoffmann-La Roche Ltd., 286 St. Paul Street, West, Montreal, Quebec.

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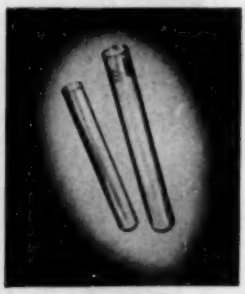

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what *are your patients asking*

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No matter what the questions, chances are that most every patient will call it "Chlorophyll." You, of course, are more familiar with the scientific facts and realize that it is the water-soluble chemical derivatives of chlorophyll which are the effective agents whether for deodorizing, wound healing or other medical uses. Presently accepted terminology for these derivatives is chlorophyllins or chlorophylls.

As penicillin derives from the mold, as amino compounds derive from ammonia – so do water-soluble chlorophylls derive from oil-soluble chlorophyll found in nature. In the process of evolution, the end product takes on characteristics which definitely increase penetration and make better contact with odors and tissues.

What about mouth and breath odors?

In answering your patients' queries, you may safely tell them that there is ample scientific evidence that chlorophyll derivatives *do* deodorize.

Because of the wide publicity given tooth pastes, tablets, and lozenges containing chlorophylls and suggested for deodorization, these are often the first uses to be questioned. Mouth odors of strictly local origin developing from putrefying food particles in the mouth are the chief offenders. Other causes of offensive odors in the mouth may be putrefying saliva, pyorrhea, caries, or other pathological conditions. It is generally agreed that if cholorophylls are to be effective deodorizers, they must come in direct contact with the source of the odor. Thus chlorophyll-containing tooth pastes and mouth washes and "mint type" lozenges to be held in the mouth are a practical form of administration. Breath odors of systemic origin can be neutralized only by ingestion of chlorophylls and not by treating the mouth alone. If failures occur it is probably due to not reaching the source of the odor, to the use of inactive materials such as oil-soluble chlorophyll, or to inadequate dosage of water-soluble chlorophyll for the condition involved. If the source of the odor remains in the mouth, repeated application of chlorophylls is necessary for deodorization.

In a carefully controlled comparison, Harrisson found that chlorophyll-containing chewing gums and lozenges reduced mouth odors from onion, beer, and cigarette smoking quicker and more effectively than did similar products without chlorophylls.

What about over-dosage?

Through all the history of the use of chlorophyll and chlorophyll derivatives there have been no reports of toxicity regardless of route of administration – topically, internally, or intravenously.

In laboratory tests on animals it has been demonstrated that on a comparable weight basis, man can tolerate a single oral dose of over 200 grams of high potency chlorophylls. Since usual dosage found in chlorophyll products taken without medical supervision is 5 to 10 milligrams per dose, there appears to be ample leeway for prescription of more concentrated dosage when indicated.

about chlorophyll?

What about normal body odors?

For combatting body odors the studies of Tebrock, of Westcott, of Taber, and of Montgomery and Nachtigall offer good positive evidence of the effectiveness of chlorophyll derivatives. When professional consideration of the psychic and social effects of offensive body odors influence medical recommendations, Tebrock's industrial plant studies are of particular interest, 567 subjects took two chlorophyll tablets daily, observed usual personal hygiene, but used no other deodorants. In 66% menstrual odor was obliterated, in 87% breath odor was helped, in 78% perspiration odor benefited, and in 62% foot odor was relieved.

Taber completely eliminated lochial and menstrual odors in a high percentage of women tested by divided doses of four chlorophyll tablets daily. Deodorization continued five to twelve hours after the last dose. Westcott's concern with the effect of chlorophyll fractions on body and breath odors resulted in evidence that they effectively neutralize obnoxious odors from perspiration due to physical exercise, nervousness and illness, from foot odors, menstrual odors, and urine odors. Montgomery and Nachtigall confirmed Westcott's work using 200 mg. of water-soluble chlorophyll a day and reduced odors from pathological conditions with a 300 mg. daily dosage.

What about odors from pathological conditions?

Other investigators, too, have used chlorophyll fractions with success to combat odors concomitant to pathological conditions which cause disagreeable fecal odors or are odorous of themselves due to suppuration or putrefaction. Goodman, Astler and Morley, Joseph, and Weingarten and Payson have all eliminated fecal odors due to colostomy in a wide range of patients. Gruskin reported prompt disappearance of odor even in cases of ulcerative carcinoma. His complete work covered 1200 foul smelling lesions on which chlorophylls were used to promote wound healing. Positive results with water-soluble chlorophyll in wound healing are so well documented that space does not permit a full discussion here.

Want to read more on chlorophyll?

Complete bibliographic references for all studies mentioned here are published in "CHLOROPHYLL 1953" by Dr. Walter H. Eddy. On these pages is only a part of the story on chlorophyll. We hope to be able to tell more in subsequent issues. In the meantime, why not send for your FREE COPY of this completely documented, authentic review of all the research literature on chlorophyll from Joseph Priestley in 1772 to date? 60 pages, 156 references. The supply is limited, so write at once to:

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1. Anderson, H. H., et al. (1952), Fumagillin in Amebiasis, Amer. J. Trop. Med. & Hyg., 1:552, July.

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References:

(1) Hopkins, J. G., et al: J. Invest. Dermat., 7, 239-253, 1946.

(2) Sullivan, M., and Fishbein, H. A.: J. Invest. Dermat., 10, 293-299, 1948.

(3) Peck, S. M., and Rosenfeld, H.: J. Invest. Dermat., 1, 237-265, 1938.

(4) Schwartz, L., et al: J.A.M.A., 132, 58-62, 1946.

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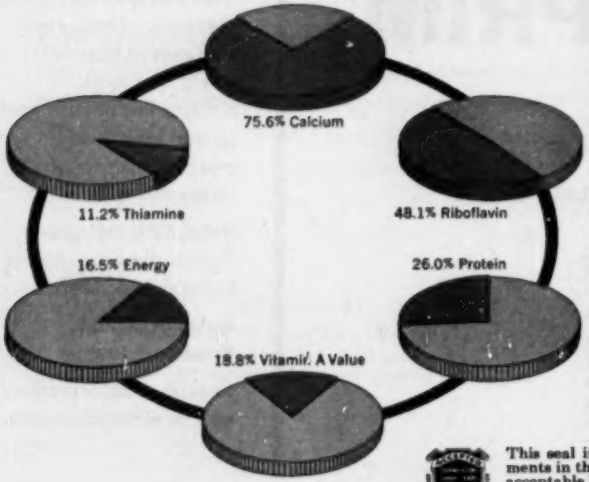

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[1]The Marketing and Transportation Situation, Bureau of Agricultural Economics, U.S.D.A. (March-April) 1952.

[2]Data from Bureau of Human Nutrition and Home Economics, U.S.D.A., 1952.

[3]Everson, G., Wheeler, E., Walker, H., and Caulfield, W. J.: Availability of riboflavin of ice cream, peas, and almonds, judged by urinary excretion of the vitamin by women subjects. J. Nutr. 35:209 (Feb.) 1948.

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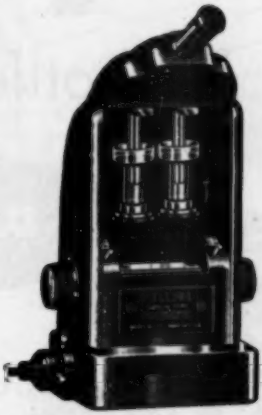

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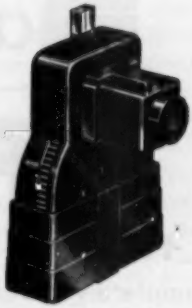

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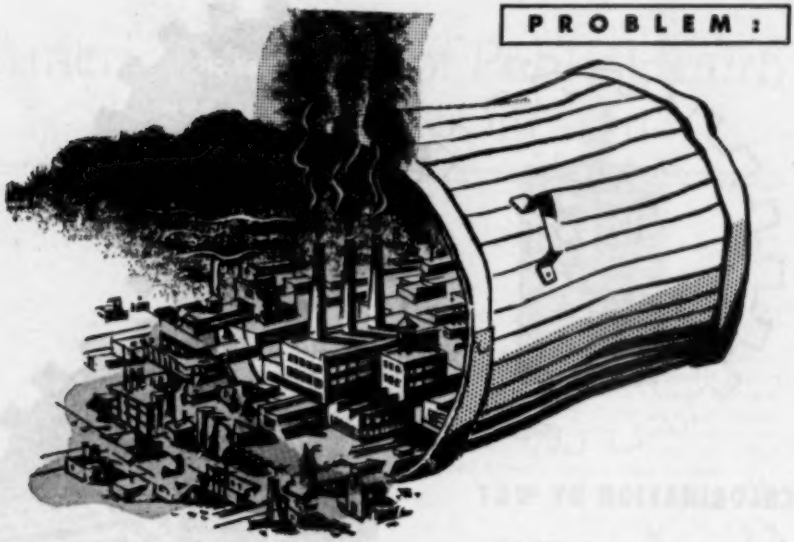

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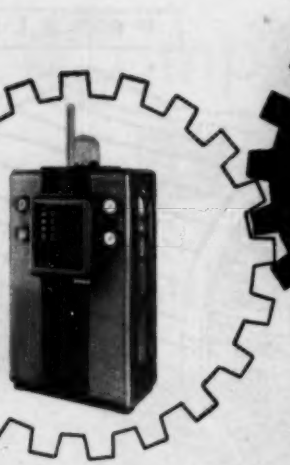

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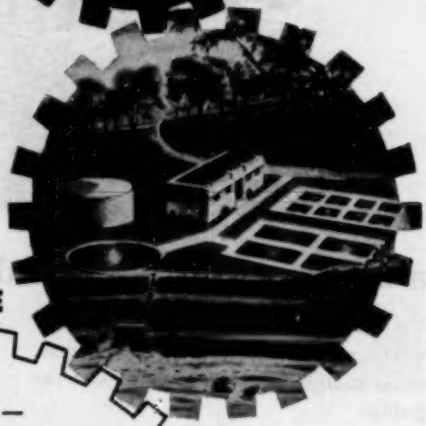

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American Journal of Public Health
and THE NATION'S HEALTH

Volume 43 June, 1953 Number 6

Is the common concept of histoplasmosis one of a disease widespread in certain areas of the country but usually rather innocuous and of importance to public health chiefly because it complicates the reading of chest x-ray films in tuberculosis case-finding surveys? Then this picture of sudden and circumscribed outbreaks will markedly alter that concept. Findings on the method of spread contain much that is new.

The Occurrence of Histoplasmosis in Epidemics—Epidemiological Studies*

J. THOMAS GRAYSTON, M.D., AND MICHAEL L. FURCOLOW, M.D., F.A.P.H.A.

Epidemiologist, Kansas City Field Station; and Senior Surgeon, In Charge, Investigations Section; Communicable Disease Center, Public Health Service, University of Kansas Medical Center, Kansas City, Kans.

THE occurrence of a series of epidemics of histoplasmosis has offered an opportunity to add to our knowledge of the epidemiology of this disease. In recent years numerous studies employing the histoplasmin skin test have revealed the remarkable geographic distribution of this infection (summarized by Mochi and Edwards [1]). The wide clinical spectrum of this disease from benign to fatal cases has been confirmed by careful clinical studies (Christie [2] and others), to which the epidemics have contributed.[3] A variety of animals have been found to be infected with *Histoplasma capsulatum*,[4] and the fungus has been cultured from the soil.[5] Definitive data on the natural reservoir of the fungus and its mode of spread to human beings have been lacking. The purpose here is to report the epidemiological studies of a group of outbreaks of histoplasmosis. Special emphasis will be placed on data which add to our knowledge of the natural reservoir of Histoplasma and its transmission to man.

* Presented before the Epidemiology Section of the American Public Health Association at the Eightieth Annual Meeting in Cleveland, Ohio, October 21, 1952.

Two epidemics of histoplasmosis have been previously recorded. The only epidemic in which the etiology was established in the acute phase by isolation of the organisms from a patient was reported by Loosli, Grayston, Alexander, and Tanzi.[8] White and Hill,[6] on the basis of follow-up skin tests, serological tests, and chest x-rays, incriminated histoplasmosis in an epidemic which was originally reported by Nauen and Korns.[7] Several reports of outbreaks of pulmonary disease of undetermined etiology have appeared in the past 10 years. These epidemics have been characterized by febrile illnesses and chest x-ray findings of disseminated pneumonitis. With the cooperation of the original authors, we have carried out studies on six of these epidemics[7-12] which have helped establish the etiology as histoplasmosis.* In addition, we have studied seven other outbreaks with similar clinical findings and found them to be histoplasmosis. The etiologic studies on this series of epidemics are being reported elsewhere.[13] To briefly summarize them here: the diagnosis is based on positive histoplasmin skin tests, positive histoplasmosis serological tests, development of miliary calcification, and isolation of *H. capsulatum* from the soil at the point source of the epidemic. All of those individuals involved in the outbreaks who were skin tested with histoplasmin reacted. Some serologic evidence of histoplasmosis was obtained in all the epidemics. In the majority of the epidemics, excellent serologic evidence was obtained on most of the patients. Pulmonary calcification, predominantly of the disseminating miliary type, has been demonstrated in all except the two most recently occurring outbreaks. Details of the soil studies will be discussed below.

* In two epidemics[7, 10] our contribution was limited to isolation of Histoplasma from point source soil samples.

Among the epidemics considered in the companion paper on etiology,[13b] comprehensive epidemiologic studies were included in the original reports of four.[7, 9-11] These reported data will be summarized briefly in this paper along with the presentation of the information on nine epidemics on which we have performed epidemiologic studies. Of these, seven are as yet unreported. In three of the unreported epidemics, the studies were made possible by help from physicians caring for the patients. We are indebted to them for some of the data used.[14-16]

RESULTS

In each of the 13 epidemics to be considered, it has been possible to find a common place of exposure. A common exposure is supported in many of the epidemics by the close proximity of the dates of onset of illness of all those involved. The time span of onsets and the incubation periods are presented in Table 1. In nine epidemics the span of onsets did not exceed 12 days. At no time did secondary cases appear in family contacts or associates not exposed to the common source. In two epidemics (Gruber, Okla., and Madison, Wis.) where there was a wider span of onset dates, it was possible to show similar incubation periods from exposure to a common source at different times. The incubation period showed some variation but tended to be from one to two weeks.

In many of the epidemics an obviously unusual common activity has pointed to a single place for exposure. This has not been true of all the outbreaks, and cultural study of soil samples from some has aided in the delineation of the sources of the infection. Histories of the activities of those involved in the epidemics have allowed determination of possible modes of transmission. A description of the point source and the suspected mode of transmission in each epidemic follows:

TABLE 1

*The Time Span of Onsets of Illness and the Incubation Periods of 11 * Epidemics of Histoplasmosis*

Place	*No. Persons Sick*	*Onsets-Span in Days*	*Incubation Periods in Days*
Plattsburg, N. Y.	23	7	7–14
Crowder, Mo.	40	10	?
Gruber, Okla.	35	(2 mos.) †	8–18
Williamsburg, Kans.	5	7	6–16
Cincinnati, Ohio	12	9	5–14
Kansas City, Mo.	5	12	7–19
Foreman, Ark.	25	9	4–13
Detroit Lakes, Minn.	6	3	?
Madison, Wis.	12	(3 mos.) †	5–10
Bath, Ill.	2	7	14–21
Mandan, N. D.	5	3	12–16

* This information not available for Bellevue, Ia., and Topeka, Kans., epidemics
† Exposure at different times

Plattsburg, N. Y.—An epidemic of "Acute Miliary Pneumonitis" occurring in a group of WPA workers dismantling an old school building in Plattsburg, N. Y., has been described by Nauen and Korns.[7] In November, 1938, 19 of 21 men became ill who were intimately associated with what was an extremely dusty job of shoveling large amounts of pigeon droppings and carcasses from the bell tower and ceilings of the building. A picture of the school building many years before its destruction is shown in Figure 1.

Since a new library building and cemented grounds now cover the old site of the school, it was impossible to examine soil from the exact point source of this epidemic. Soil samples obtained from surrounding areas and buildings were cultured. A sample from the dirt basement of a church two doors from the former site of the school building contained *H. capsulatum*.

Camp Crowder, Mo.—In May, 1943, at Camp Crowder, a group of Army trainees suffered a simultaneous respiratory infection characterized by disseminated infiltrations on x-ray. Idstrom and Rosenberg [8] reported that approximately 40 men in one company were involved. The men had been working as clean-up teams "clearing out dusty abandoned homes, barns, chicken coops, and other outhouses prior to installation of Signal Corps equipment." Records have been located indicating that 22 men were hospitalized at the time of the outbreaks. Follow-up studies have been directed at this group.

A fairly well circumscribed area about one-half mile long where the company involved had been training at the time of the epidemic was outlined by investigation on the Crowder reservation. Unfortunately, at this late date it was not possible to determine more precisely the buildings in which the men who became ill had worked. A series of soil samples were obtained from inside and around all the buildings in the designated area. Histoplasma was isolated from three of the samples taken from around buildings on both sides of the road over a stretch of approximately 100 yards.

Camp Gruber, Okla.—An epidemic called "Unusual Pulmonary Disease" occurring in some 35 soldiers at Camp Gruber, Okla., in 1944 has been described.[9] Only men visiting a certain storm cellar were involved. There was no door on the cellar, but the men placed a blanket over the opening and built a fire of rotten boards from the ceiling and strips of bark and chips of wood from the elm supporting logs. In addition to the large original group exposed at the time of building the fire, eight men were

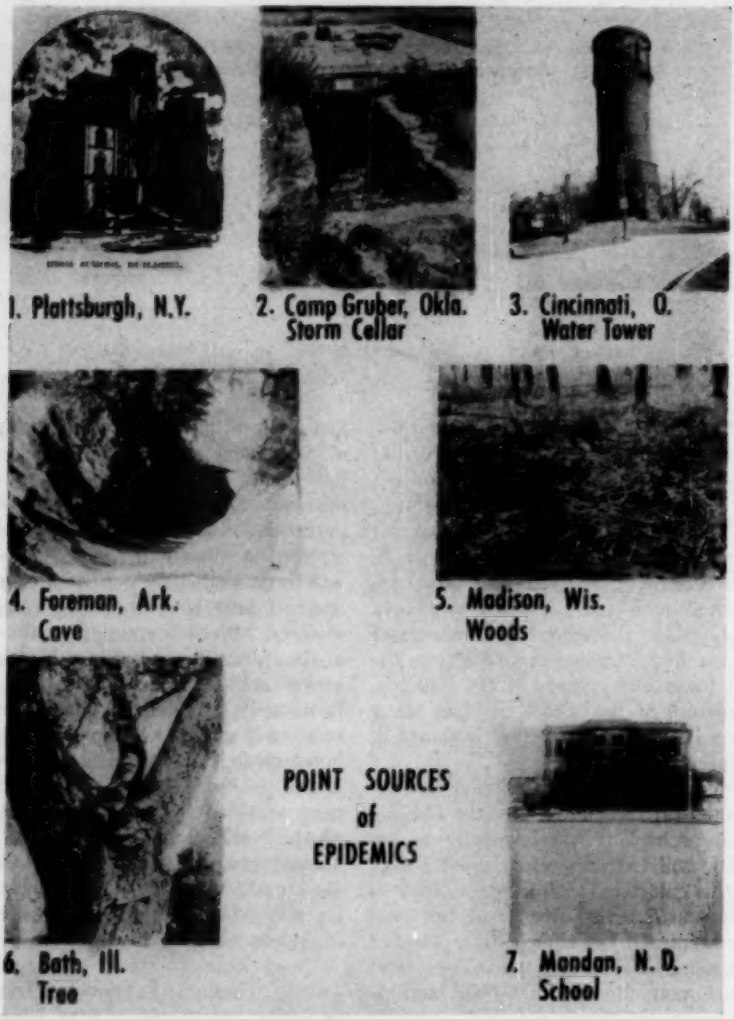
1. Plattsburgh, N.Y.
2. Camp Gruber, Okla. Storm Cellar
3. Cincinnati, O. Water Tower
4. Foreman, Ark. Cave
5. Madison, Wis. Woods
POINT SOURCES of EPIDEMICS
6. Bath, Ill. Tree
7. Mandan, N. D. School

FIGURE 1—Examples of several of the point sources of the epidemics of histoplasmosis

exposed a week later, and two men two months later. All those exposed at a later date had mild disease or no disease at all. The entrance to the cellar is shown in Figure 1. Soil samples have been collected from the cellar and Histoplasma isolated from samples collected on four different occasions.

Topeka, Kans.—Study of a 12-year-old boy with disseminated miliary calcification revealed a history of an acute febrile illness with pulmonary symptoms seven years previously in September, 1944, while he was living on a farm 15 miles north of Topeka, Kans. Investigation was carried out on the members

of his family and of two other farm families who had lived on the farm subsequently. In all, 11 persons were examined. Four were found to have disseminated miliary lesions showing early calcification. These four consisted of a young boy in each family, plus a youngster who had visited the farm and came to attention because of a history of illness. Additional findings consisted of single or several pulmonary calcifications in four adult members of the families.

Soil samples from in and about the buildings of this farm were examined. One sample from a small shed immediately in back of the farm house yielded *H. capsulatum*.

Williamsburg, Kans.—On November 15, 1946, a family of nine members moved to a farm near Williamsburg, Kans. Nine days later three of the children had onset of mild febrile illnesses. A week later a fourth child became ill with more severe symptoms. Chest x-rays on the entire family showed that pulmonary infiltrations were present in the four children who had been sick and, in addition, in a 14-month-old infant who had not been noticeably ill. The five children with pulmonary pathology ranged in ages up to 10 years. The parents and the two older children had no findings. Only the child with the more severe illness exhibited numerous widespread miliary infiltrations, the others having one or several localized lesions with hilar adenopathy. It was not possible to incriminate any activity or location as likely source for the infection as the children had investigated all the buildings and grounds in the first few days on the farm. Soil samples were collected from all areas of the farm in 1952, and a strain of fungus which passes through mice and resembles *H. capsulatum* grossly has been secured. It has not been possible as yet to positively identify this strain as Histoplasma.

Cincinnati, Ohio—An epidemic of disseminated pneumonitis occurred in Cincinnati in July, 1947.[10] Twelve men who were exposed to the cleaning of pigeon excreta from an abandoned water tower became ill. This water tower is in a park not far from downtown Cincinnati. A picture of the tower is shown in Figure 1. The large amount of pigeon excreta was in the basement of the tower. A few of the 12 men just visited the tower at the time of the cleaning and did not actually handle the material. Soil samples from the tower and other surrounding sites have been cultured, but we have been able to isolate Histoplasma only from the basement of the water tower.

Kansas City, Mo.—In July, 1947, an elderly couple were preparing to move to a farm just outside Kansas City, Mo. Several of their grandchildren went to the farm with them on different days to help clean it. Four of the children and the grandmother became ill. No illness occurred in the grandfather, but histoplasmin skin test conversion was demonstrated in August. Chest x-rays revealed infiltrations on all these six persons. Numerous miliary lesions appeared in three children with more severe illnesses.

The only time these four children had visited the farm together was on July 7. The major activity on that day was tearing down a chicken coop. This was remembered as a dusty job. Soil samples collected from around the farm in 1952 have shown one positive for Histoplasma. This particular sample came from approximately the original site of the chicken coop.

Foreman, Ark.—The epidemic reported by Washburn, Tuohy, and Davis[11] as "Cave Sickness" occurred in September, 1947. Twenty-five men and boys became ill with fever and pulmonary manifestations after digging out an old filled in cave near Foreman, Ark. Persons actually involved in the excava-

tion or visiting closely to it were sick. Many of the patients were only mildly ill. Those having more prolonged exposure had the severest illnesses. Although most of those x-rayed showed disseminated infiltrations, there were some with only localized infiltrates.

The cave does not enter into the side of a hill but goes downward into the earth at a 60° angle with the main room off to the right after a 10-foot descent. At first, a bulldozer uncovered the opening to the cave and then the cave was dug out with shovels. A picture of the entrance to the cave as it now appears is shown in Figure 1. Soil samples were collected from inside and around the cave. *H. capsulatum* was isolated from a sample taken from inside the cave.

Detroit Lakes, Minn.—During the last week of January, 1948, all six members of a farm family living near Detroit Lakes, Minn., became ill. Four required hospitalization while two recovered on bed rest at home. Chest x-rays showed disseminated lesions in all. The details of the clinical illnesses have been reported by Rutledge [12] as an unknown pulmonary illness.

Epidemiologic studies carried out in the fall of 1951 failed to reveal a single incident of unusual group activity to which the infection might be attributed. Since a two-foot layer of snow had covered the area for over six weeks, much of the usual movement and activity about the farm was curtailed. The family spent most of their time in the kitchen and dining room of the house where wood warming stoves were present. It was possible to establish by history that the only place all six members of the family had been together during the two months preceding their illness was in the farmhouse. The only material being brought into the house at that time was the firewood for the warming stoves.

Soil samples were collected from about the farm and buildings. The only one yielding Histoplasma on culture was from loose dirt underneath the kitchen of the farmhouse.

Madison, Wis.—During June, July, and August, 1948, a series of cases of disseminated pneumonitis occurred in Madison, Wis. Chest x-rays were available on 10 of the 12 patients and all showed some scattered miliary lesions, although these were frequently fewer in number than in many of the other outbreaks. The cases occurred two and three together in families and among friends. Investigation revealed that a common source existed for the cases in a sparsely wooded area near an outlying manufacturing district. All those who were found with the illness had visited this area to dig angleworms. The wooded area was in low-lying moist land surrounded by high weeds. In the place among the trees where the worms had been dug, there was no growth of foliage on the ground (Figure 1). Several soil samples were obtained from the general area. Samples from the site of digging have yielded *H. capsulatum* on two separate occasions.

Bath, Ill.—In April, 1951, two nine-year-old cousins became ill within a week of each other. Chest x-rays showed numerous disseminated infiltration in both. History revealed that approximately three weeks prior to onset of the illnesses the two cousins had played together. It was well remembered that the boys had climbed up into a tree and let themselves down into the hollow trunk (Figure 1). They were in this very cramped situation for over an hour. Because of the narrow opening the boys were trapped in the tree, and one of their fathers had to come with a ladder and extricate them from the hole. The tree is located in the schoolyard near the center of Bath, Ill., a small town lying along the Illinois River.

Soil samples were collected from inside the tree and the surrounding areas.

A considerable amount of loose material could be scooped out of the bottom of the hole in the tree trunk. It consisted of dried powdery wood chips and flakes intermixed with sandy soil. Histoplasma has been isolated on two occasions from samples taken from inside the tree.

Bellevue, Ia.—In September, 1951, our attention was drawn to a culturally proven fatal case of histoplasmosis in a five-month-old infant in Iowa.* The case was of interest as it appeared that the infection must have occurred during the first six weeks of the baby's life. She had been taken to California, which is out of the known histoplasmosis area, at 6 weeks of age and returned to Iowa only three days before hospitalization. Prior to leaving for California the baby had lived with her mother on the maternal grandparents' farm outside Bellevue, Ia. Other persons living on the farm during these six weeks were the grandparents and their two sons. Each member of the household was examined. The two boys (17 and 19 years) were found to have disseminated fine infiltrations on chest x-ray. The grandfather exhibited well healed multiple pulmonary calcifications. He had lived on the farm for 30 years. During the early summer just after the infant had been on the farm, both of the boys had mild "flu-like" illnesses.

The infant had not been on the ground outside the farmhouse or in any of the other buildings. During the spring of the year, the wood burning heating stove in the living room of the farmhouse was used frequently to keep the baby warm. This seemed to be the main contact the baby had with material from outside the house. Cultural examination of samples of wood and soil from all areas around the farm resulted in finding one positive for *H. capsulatum*. This one was from soil collected from along the outside of the house below the living room.

* By Dr. I. H. Borts.

Mandan, N. D.—An epidemic occurred in Mandan, N. D., during February, 1952, involving four men. The story is very reminiscent of the Plattsburg, N. Y., outbreak, as these men were engaged in tearing down an old abandoned school house (Figure 1). A considerable amount of pigeon and, possibly, bat droppings was removed from rafters and window casings of the building approximately two weeks prior to the onset of severe pneumonic illnesses. This activity raised such a high concentration of dust that, despite the bitter cold weather, the windows were opened in order to breathe. Although each man had numerous widely disseminated lesions on x-ray, it was apparent that two of the men suffered a more severe illness than the others. The men worked in pairs on days off from their regular railroad jobs. The two with the severest illness had been more intimately involved with the removal of the droppings.

When visited five months after onset of the illness, the building had been completely leveled. The building site is within the city and less than 100 yards from the municipal swimming pool. Soil samples were obtained from about the foundation of the building and from surrounding areas. Laboratory examination of these samples is not yet completed.

Table 2 summarizes the activities associated with infection and the common sources of the epidemics.

Other Epidemics—The proven epidemic reported by Loosli and associates [3] involved the members of a farm family who were infected from sawdust material in an abandoned silo. Other outbreaks of disseminated pneumonitis have occurred. In three of these, excellent serological evidence supporting the diagnosis of histoplasmosis has been obtained. One which was referred to by Sabin [10b] involved seven men who had shoveled pigeon manure from a church

TABLE 2

Tabulation of the Activities Associated with Infection and the Common Sources of 13 Epidemics of Histoplasmosis

Place	*Activity*	*Common Source*	*Histoplasma Soil Isolation*
Plattsburg, N. Y.	Shoveling pigeon excreta	Schoolhouse	Nearby church basement
Camp Crowder, Mo.	Cleaning	Farm buildings	Shed, cellar, and barn
Camp Gruber, Okla.	Building fire	Storm cellar	Storm cellar
Topeka, Kans.	Playing	Farm	Shed
Williamsburg, Kans.	Playing	Farm	..
Cincinnati, Ohio	Shoveling pigeon excreta	Water tower	Water tower
Kansas City, Mo.	Tearing down	Chicken coop	Site of chicken coop
Foreman, Ark.	Digging earth out	Cave	Cave
Detroit Lakes, Minn.	Wood fire (?)	Farmhouse	Underneath kitchen
Madison, Wis.	Digging fishing worms	Area in woods	Area in woods
Bath, Ill.	Playing	Hollow tree	Hollow tree
Bellevue, Ia.	Wood fire (?)	Farmhouse	Edge of house
Mandan, N. D.	Shoveling pigeon excreta	Schoolhouse	..

TABLE 3

Attack Rates in Seven Epidemics of Histoplasmosis Among Those Persons Intimately Associated with the Activity at the Point Source Incriminated As Being the Mode of Infection

Place	*No. with Signs or Symptoms*	*No. Intimately Exposed*	*Attack Rate Per cent*
Plattsburg, N. Y.	19	21	90
Gruber, Okla.	29	30	97
Kansas City, Mo.	6	6	100
Foreman, Ark.	25	25	100
Detroit Lakes, Minn.	6	6	100
Bath, Ill.	2	2	100
Mandan, N. D.	4	4	100

belfry in Warrenton, N. C.; another, to be reported by Woodward,[17] involved four brothers in a farm family who had recently cleaned manure out of a barn on a farm near Taneytown, Md.; and the third which has been studied by Englert[18] involved three men who scraped bat dung from a bridge in Maryland.

Although attention is much less likely to be attracted, single cases of disseminated Histoplasma pneumonitis occur with stories of infection similar to the epidemics. We have studied two such cases: one in which a farmer became ill following cleaning pig manure from a barn, and the other in which a soldier was infected while cleaning debris from a chicken coop. Histoplasma was isolated from the chicken coop.

Attack Rates—The calculation of attack rates is possible in seven of the epidemics where the number of persons exposed to a definitely incriminated common source is known. If only the persons intimately associated with the activity at the point source are considered, the attack rate in each of these epidemics is 90 per cent or above (Table 3).

Severity of Disease and Extent of Exposure—Although there was a remarkable similarity in the type of clinical and x-ray picture observed in all the epidemics, considerable variation was found in the severity of disease among the individual patients. It was possible to show in many of the epidemics that both the severity of symptoms and the number of lung lesions had a direct relation to the length or intensity of exposure to the point source.

On the basis of all-over severity the epidemics can be divided into more

TABLE 4

Comparison of the All-Over Severity of Each Epidemic of Histoplasmosis with the Extent of Enclosure of the Point Source of the Epidemic

More Severe Epidemics		*Less Severe Epidemics*	
Plattsburg, N. Y.	Enclosed	Crowder, Mo.	?
Gruber, Okla.	"	Topeka, Kans.	Partially open
Cincinnati, Ohio	"	Williamsburg, Kans.	?
Detroit Lakes, Minn.	"	Kansas City, Mo.	Open
Bath, Ill.	"	Foreman, Ark.	Mostly open
Mandan, N. D.	"	Madison, Wis.	Open
		Bellevue, Ia.	?

severe and less severe groups. These groups can be seen in Table 4, along with an evaluation of the extent of enclosure of the point sources. A correlation between the intensity of exposure and the severity of the epidemic is suggested by the finding that infection in the more severe epidemics occurred in closed places.

Animal Illness—In all the epidemics investigated an effort was made to obtain information regarding any illnesses in animals. There had been occasional disease in the animals of the various farms involved but nothing suggestive of being histoplasmosis. Skin testing of the animals on two of the farms shown to be sources of human infections was carried out. Two cows of 10 tested on the Williamsburg, Kans., farm were positive to histoplasmin. In addition, one of two dogs reacted. The three reacting animals were autopsied but showed no findings of active histoplasmosis. At the Bellevue, Ia., farm seven of 19 cattle reacted positively to histoplasmin. Only one other reactor was found in the same county out of 187 cows tested.

Approximately half of the common sources of the epidemics were definitely noted to be associated with animal excreta. Careful search in the other cases, where an exact source was known, failed to reveal evidence of animal contamination; however, the possibility of such could not be ruled out, since in many cases the point sources were examined a number of years after the occurrence of the epidemic.

Environmental Observations—Studies have shown that *H. capsulatum* requires very high humidity for growth in soil under laboratory conditions.[19] Measurements of temperature and humidity in one open and one closed point source have been made. Humidity recordings obtained from inside the Camp Gruber storm cellar showed readings of over 95 per cent at least once a day for five consecutive days. The temperature ranged between 70° and 80° F. on those days. Records were taken over a 14-day period in the wooded area outside Madison, Wis. The humidity was above 95 per cent at some time during all 14 days, and for five consecutive days remained above 95 per cent for all but 15 hours. The temperature ranged from 47° to 76° F. during the two-week period.

General observation of the other known exact point sources revealed evidence of frankly moist areas with the suggestion of the possibility of high humidity.

Attempts to show consistent association of the common sources with various climates or vegetation have been unsuccessful. The finding of rough wooded areas on the farms and Army camps involved and near the Arkansas cave deserves mention.

Location of Epidemics and Endemic Areas of Histoplasmosis—The location of the epidemics of histoplasmosis in relationship to histoplasmin sensitivity areas appears in Figure 2. Only three of the epidemics occurred in the area of greatest endemicity of histoplasmosis as shown by histoplasmin sensitivity. Some

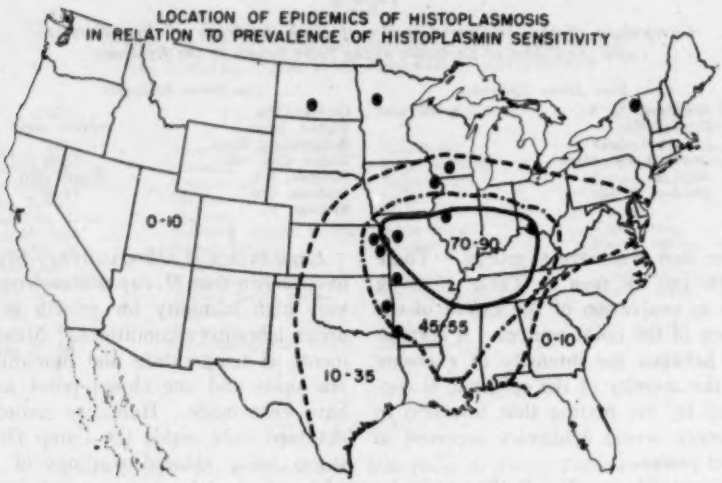

FIGURE 2—The areas of histoplasmin sensitivity are shown schematically by the approximate per cent of young adults reacting to histoplasmin

of the epidemics occurred in areas of low histoplasmin sensitivity. In addition, it was found that all the soldiers involved in the two Army camp epidemics came from states with low prevalence of histoplasmin reactors.

In attempting to determine the probability of previous Histoplasma infection in those persons involved in the epidemics on the basis of the distribution of histoplasmin sensitivity, it is necessary to consider the ages of the individuals as well as their residences. The prevalence of histoplasmin reactions in children may be much lower than adults in the same area. The involvement of children in many of the epidemics occurring in areas of relatively high histoplasmin sensitivity would, therefore, add to the impression that persons involved in epidemics of histoplasmosis tend not to have had previous exposure to the fungus. This impression gains support from the data available in the Kansas City, Mo., epidemic. Skin test conversion was demonstrated on one of the adults, and, in addition, due to routine skin testing of school children it was known that three of the children involved in this epidemic failed to react to the histoplasmin skin test two months prior to their illnesses. A major exception exists to this conclusion regarding previous exposure in the Cincinnati, Ohio, epidemic. Cincinnati is an area of extremely high prevalence of histoplasmin reactors. Some of the 12 adult men involved in this epidemic most certainly had previous histoplasmosis infections.

DISCUSSION

With the exception of the generalized variety, histoplasmosis is predominantly a pulmonary infection. It has been speculated that the usual mode of infection is by inhalation of the organism. This theory gains powerful support from the nature of the disease and apparent mode of infection in the series of epidemics herein discussed. The recurring story was found of exposure to dust

created by agitation of material proved to contain Histoplasma spores, resulting after from one to three weeks in illness associated with numerous discrete pulmonary infiltrations. A correlation between the number of the lesions and the severity of the illness on the one hand and the length and intensity of the dusty exposure on the other was established both between epidemics and within a given epidemic. The x-ray picture of numerous discrete pulmonary infiltrations would appear to represent numerous primary lesions caused by inhalation of a large number of spores with their deposition in many alveoli. The possibility of such deposition has been supported by the finding that the size of the majority of the Histoplasma spores is under 5 microns.[20]

Age, sex, and possibly immunity seemed to exert much less effect on the immediate disease picture than did extent of exposure. However, these factors apparently played a role in the development of complications and of generalized disease. The only fatality in the entire group occurred in an infant, and the only other cases exhibiting the generalized form of the disease were two older men.

Environmental studies fail to reveal complete consistency in the nature of the point sources of the epidemics or in the type of material containing the organisms. The frequent association with animal excreta is of interest. However, no evidence of animal contamination of the source material could be found in nearly one-half of the outbreaks. It seems likely that the excreta may merely have contributed to a good growth condition for the organism rather than indicating an animal carrier. The involvement of wood as a vehicle of infection in four of the epidemics further emphasizes its position as possibly important to the growth of Histoplasma in nature. It is recalled that sawdust was prominently incriminated in the previously reported Lowell, Ind., epidemic.[3] The requirement of the organism for high humidity for growth in nature was apparently met at the point sources without precluding sufficient drying of the material to permit it to become air-borne when agitated.

Information gathered from laboratory histoplasmosis infections[21] has shown that although infection continues to occur among newly introduced histoplasmin-negative individuals, previously infected persons have not had second illnesses. This would indicate that infection with Histoplasma whether of clinical significance or not, provides resistance to reinfection. The findings in 12 of the 13 epidemics are consistent with this view. On the basis of place of residence and age of the persons involved in 12 of the epidemics there seems little chance that they had had previous histoplasmosis infections. The Cincinnati, Ohio, epidemic was an exception. It seemed most likely that many of those involved in this epidemic had previous infection. It would appear that although the usual epidemic would involve susceptible histoplasmin-negative persons, heavy exposure in persons with previous infection is capable of causing illness. In this connection it is of interest that the pulmonary x-ray picture of the Cincinnati patients exhibited a possible difference from that seen in most of the other epidemics in that the individual discrete lesions were smaller and there was an absence of hilar reaction.[10c]

SUMMARY

The epidemiologic features of 13 epidemics of histoplasmosis are presented. The common source nature of each outbreak is established. Description of the activities at the point sources and the clinical features of the illnesses lead to the conclusion that infection occurred through the inhalation of air-borne organisms. The presence of Histoplasma

in the soil material at the point sources of most of the epidemics was demonstrated. Environmental studies, including animal illnesses, failed to establish any consistent factors at all the common sources of infection. Evidence of the role of previous infection as indicated by histoplasmin sensitivity in creating immunity to further histoplasmosis is discussed.

REFERENCES

1. Mochi, E., and Edwards, P. Q. Geographical Distribution of Histoplasmosis and Histoplasmin Sensitivity. *Bull. World Health Org.* 5:259–291, 1951.
2. Christie, A. The Disease Spectrum of Human Histoplasmosis. *Tr. A. Am. Physicians* 64:147–154, 1951.
3. Loosli, C. G., Grayston, J. T., Alexander, E. R., and Tanzi, F. Epidemiological Studies of Pulmonary Histoplasmosis in a Farm Family. *Am. J. Hyg.* 55:392–401 (May), 1952.
4. Emmons, C. W. Histoplasmosis in Animals. *Tr. New York Acad. Science* 2:248–254 (May), 1949.
5. (a) ————. Isolation of *Histoplasma capsulatum* from Soil. *Pub. Health Rep.* 64:892–896 (July 15), 1949.
   (b) Zeidberg, L. D., Ajello, L., Dillon, A., and Runyon, L. C. Isolation of *Histoplasma capsulatum* from Soil. *A.J.P.H.* 42:930–935 (Aug.), 1952.
   (c) Grayston, J. T., Loosli, C. G., and Alexander, E. R. The Isolation of *Histoplasma capsulatum* from Soil in an Unused Silo. *Science* 114:323–324 (Sept. 28), 1951.
   (d) Larsh, H. W., Hinton, A., and Furcolow, M. L. Laboratory Studies of *Histoplasma capsulatum*. III. Efficiency of the Flotation Method in Isolation of *Histoplasma* from Soil. *J. Lab. & Clin. Med.* 41:478–485 (Mar.), 1953.
6. White, F. C., and Hill, H. E. Disseminated Pulmonary Calcification. A Report of 114 Cases with Observations of an Antecedent Pulmonary Disease in 13 Individuals. *Am. Rev. Tuberc.* 62:1–16 (July), 1950.
7. Nauen, R., and Korns, R. F. A Localized Epidemic of Acute Miliary Pneumonitis Associated with the Handling of Pigeon Manure. Paper read at the Annual Meeting of the American Public Health Association (Oct.), 1944.
8. Idstrom, L. G., and Rosenberg, B. Primary Atypical Pneumonia. *Bull. U. S. Army M. Dept.* 81:88–92, 1944.
9. Cain, J. C., Devins, E. J., and Downing, J. E. An Unusual Pulmonary Disease. *Arch. Int. Med.* 79:626–641 (June), 1947.
10. (a) Feldman, H. A., and Sabin, A. B. Pneumonitis of Unknown Etiology in a Group of Men Exposed to Pigeon Excreta. *J. Clin. Investigation* 27:533, 1948.
    (b) Sabin, A. B. Miliary Granulomatous Pneumonitis in a Group of Men Exposed to Pigeon Excreta. *Tr. 47th Meet. Nat. Tuberc. A.*, 1951.
    (c) Felson, B., Jones, G. F., and Ulrich, R. P. Roentgenologic Aspects of Diffuse Miliary Granulomatous Pneumonitis of Unknown Etiology—Report of Twelve Cases with Eighteen Months Follow-up. *Am. J. Roentgenol.* 64: 740–746 (Nov.), 1950.
11. Washburn, A. M., Tuohy, J. H., and Davis, E. L. Cave Sickness: A New Disease Entity? *A.J.P.H.* 38:1521–1526 (Nov.), 1948.
12. Rutledge, L. H. An Unusual Type of Pulmonary Disease Involving Six Members of a Family. *Minnesota Med.* 33:694–699 (July), 1950.
13. (a) Furcolow, M. L., and Grayston, J. T. Occurrence of Histoplasmosis in Epidemics. *Tr. 48th Meet. Nat. Tuberc. A.*, 1952.
    (b) ————. The Occurrence of Histoplasmosis in Epidemics—Etiologic Studies. *Am. Rev. Tuberc.* (In press.)
14. Dickie, H., and Ackerman, H. Madison, Wisc., Epidemic. (To be published.)
15. Mack, J. K. Bath, Ill., Epidemic. (To be published.)
16. Shillington, M. A. Mandan, N. D., Epidemic. (To be published.)
17. Woodward, T. Personal communication.
18. Englert, E., Jr. Personal communication.
19. Menges, R. W., Furcolow, M. L., Larsh, H. W., and Hinton, A. Laboratory Studies of Histoplasmosis. I. The Effect of Humidity and Temperature on the Growth of *Histoplasma capsulatum*. *J. Infect. Dis.* 90:67–70 (Jan.–Feb.), 1952.
20. (a) Cozad, G. C., and Furcolow, M. L. Laboratory Studies of *Histoplasma capsulatum*. II. Size of the Spores. *Ibid.* 92:77–84 (Jan.–Feb.), 1953.
    (b) Helmbright, A. L., and Larsh, H. W. Size of the Spores of *Histoplasma capsulatum*. *Proc. Soc. Exper. Biol. & Med.* 81:550–551 (Nov.), 1952.
21. Furcolow, M. L., Guntheroth, W. G., and Willis, M. J. The Frequency of Laboratory Infections with *Histoplasma capsulatum*: Their Clinical and X-ray Characteristics. *J. Lab. & Clin. Med.* 40: 182–187 (Aug.), 1952.

When dealing with human beings controlled experiments frequently prove to be impracticable, so for a scientific basis for our assumptions we turn to past history to reconstruct the suspected causal chain of events—and then our statistical troubles may begin, as this paper so convincingly reveals.

Philosophy of Inferences from Retrospective Studies*

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ALL purposeful acts are based on a belief in the cause and effect relationship of events. It is difficult to conceive of existence in an environment where inferences concerning the future could not be drawn from past experience. This does not mean, however, that such inferences necessarily are correct or that the postulated cause and effect sequence of events actually exists.

The most general basis for belief in the cause and effect relationship of events is the observation that they are sequentially related in time. The first event is then thought to be the cause of the second. This belief is reinforced if the particular sequence of events is frequently observed. Until relatively recent times this method of reasoning was the principal basis of man's belief in the causal connection of events. Indeed, even today, this method is widely used. It would be exceedingly difficult to find a person who has not acted on beliefs established in this manner.

The principal error which may result from this type of reasoning is the fallacy of *post hoc, ergo propter hoc*, that is, the attribution of a causal relationship between events which are merely associated in time. The development of the experimental method provided a rational basis for detecting the existence of this fallacy and made possible the analytical study of the relationship of two or more factors under controlled conditions—much of present-day science dates from this development.

The essence of the experimental method is (a) the formulation of an hypothesis, based on existing knowledge, of the possible relationship between two or more factors; (b) the definition of the population to which the results of the experiment will be generalized; (c) testing the hypothesis under known conditions with as many as practicable of the supposititious causes of variation controlled, and (d) the formulation of conclusions based upon observation or measurement of the experimental results. Before such conclusions can be accepted as a valid verification or disproof of the original hypothesis, they must be confirmed by repetition of the original experiment. Hence, reproducibility is an integral part of the experimental method.

The controlled experiment without doubt is the most powerful method of analyzing the nature of the relationship between two or more factors which has yet been developed. It is the foundation upon which much of modern science is built. Nevertheless, there are many

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natural phenomena which cannot readily be investigated in this manner. This does not mean, however, that such phenomena cannot be studied scientifically, or that there is any reason to believe that these phenomena are any less subject to the cause and effect relationship of events than are those of physics or chemistry.

There are, of course, the descriptive sciences such as paleontology, astronomy, meteorology, geology, botany, and zoology. In addition to these, the phenomena which at present seem to be least amenable to investigation by controlled experimentation are those involving human beings themselves, that is those falling in the domain of the social sciences and health and medicine.

There are many reasons why it frequently is impossible or impracticable to investigate naturally occurring phenomena by controlled experimentation. Only a few will be briefly referred to here.

In the first place, our customs and laws limit the extent to which human beings can be used in deliberate experiments which may endanger their health and well-being. Consequently, one often must await the outcome of natural uncontrolled experiments to obtain data to answer a particular question.

For example, it has been suggested that the inoculation of children against certain communicable diseases increases the likelihood that they will be attacked by paralytic poliomyelitis. It is immediately apparent that this hypothesis cannot be tested by controlled experimentation. Even if one could persuade a random group of children to be inoculated against a disease and another similar group not to be inoculated, one could not deliberately expose the two groups to poliomyelitis. As a result, the hypothesis must be tested by whatever data can be obtained from naturally occurring events.

Even in controlled experiments in biology it is often impracticable to control all possible causes of variation except the one under investigation or to make certain that a control group and a test group are identical in all characteristics which might influence the outcome of the experiment except for the factor being studied. In practice, a few of the most important factors are deliberately controlled and the possible effect of the remaining factors is equalized by assigning individuals to the test and control groups by some random method. Randomization makes possible the computation of valid estimates of sampling variation as well as being the most satisfactory method yet developed for eliminating bias in the allocation of subjects to the treated and control groups.

In many types of investigations in which human beings are involved, ethical considerations may prohibit the withholding even of a treatment the effect of which has as yet not been proved so that persons cannot be allocated at random to the control and treated groups, thus introducing biases which may becloud the results of the study. Even though a potential hazard to life or well-being may not be involved, it still may be difficult or impossible to persuade persons in administrative positions to permit randomization in the assignment of whatever is being tested. Thus, in a study of the possible effect upon health and morale of moving families from slum areas to a new housing development, administrators may feel that "practical" considerations require that the families to be moved must be selected by careful consideration of their potentiality to respond favorably to improved housing rather than by some random process.

Studies of the relationship between two characteristics of the members of a population may be complicated by a long, latent period between cause and effect. This may be illustrated by the

suggestion that smoking cigarettes may cause cancer of the lung. At first thought this appears to be a hypothesis which easily can be tested, since it is not difficult to find persons who are willing to smoke cigarettes. However, there is reason to believe that even if smoking cigarettes increases the chances of the development of lung cancer, this effect may not become manifest for as many as 20–30 years after smoking is begun. In addition, less than five per cent of persons, smokers and nonsmokers combined, who reach 20 years of age would be expected to develop cancer of the lung during their future lifetime. The inability to control exposure to other carcinogenic agents during the long interval between the time smoking is started and the time observation for cancer of the lung can be terminated; the inability to control the amount of smoking throughout this interval, in combination with the expense due to the long period of observation required, and the large number of persons which must be included due to the relatively small proportion of persons who would be expected to develop the disease, make impossible anything approaching a controlled experiment.

Faced with these and other difficulties the usual procedure is to select a group of individuals who exhibit the effect in question and then by investigation of their past history attempt to reconstruct the causal chain of events which preceded the observed effect. The individuals selected frequently are a consecutive group of patients from a single hospital. Little is known about the population of which the patients may be considered to be a sample. Thus, investigations of the relationship of smoking with lung cancer have been carried out by selecting a number of persons with cancer of the lung and interrogating each concerning his smoking habits. Another group of persons without lung cancer is selected and similarly questioned. This "control" or contrasting group usually is chosen from some convenient group of patients in the same hospital. The resulting data can be arranged as follows:

	Cancer of the Lung	*Without Cancer of the Lung*	*Total*
Smokers	A	B	A + B
Nonsmokers	C	D	C + D
Total	A + C	B + D	N

The two proportions A (A + C) and B (B + D) are compared and if A (A + C) is greater than B (B + D) it is concluded that smoking causes cancer of the lung.

The first thing to observe about this table is that it proceeds from effect to cause and not from cause to effect. The comparison is between the proportion of smokers among persons with and without lung cancer; whereas the appropriate comparison to test the hypothesis in question is the proportion of persons with cancer of the lung among smokers and nonsmokers, that is A (A + B) and C (C + D). Why is it that these latter proportions cannot be computed from these data? Primarily, due to the fact that (A + C) and (B + D) do not appear in the table in the same proportion as in the population from which the samples are selected. There are methods of correcting for this fact, but even after this is done, such data still provide an uncertain basis for causal inferences since the method of selection leaves undefined the population which the cases represent.

The second point to be noticed is that these data, as they stand, merely illustrate the relationship of two events associated in time. Suppose that the persons with cancer of the lung were largely of Scandinavian parentage, while those without cancer of the lung were largely of Italian parentage, the trait, blue eyes

and not blue eyes could be substituted for that of smoking and not smoking and a comparison of the proportions A (A + C) and B (B + D) undoubtedly would reveal that the former was considerably larger. Should we then assume that blue eyes cause lung cancer? If not, how can we differentiate between situations when it is appropriate to draw causal inferences and those in which it is not?

I know of no method of reasoning which enables one to infallibly distinguish between these two situations. Such data should be evaluated by an investigator who is thoroughly familiar with the subject, who has a strong skepticism of the possibility of interpreting events associated in time in terms of cause and effect, and who is prepared to consider the possibility that some hidden common factor may be the explanation of the observed relationship. Nevertheless, there are some precautions which may decrease the likelihood of accepting mere temporal association as evidence of a causal relationship. These may fruitfully be set forth as a series of questions to be answered before a study is initiated.

1. What is the hypothesis or hypotheses to be tested? A clear formulation of the hypothesis to be tested is essential in order to decide what subjects should be included in the study and the kinds of data to be collected.
2. What specific items of information are required to verify or disprove the hypotheses? Can these be obtained with sufficient reliability to warrant starting the investigation?
3. How would the study be conducted if it were possible to do it by controlled experimentation?

   The answer to this question often not only is helpful in planning a retrospective study but also may be of assistance in determining whether a retrospective study is worth doing.
4. How shall the sample of persons included in the study be selected?

The purpose of most studies of the kind under discussion here is to formulate generalizations which will be true for a larger population than the particular individuals for whom data are available. If this is to be possible, two conditions must be satisfied. First, the data collected must be of sufficient reliability and validity to permit testing the hypothesis in question. Second, the persons studied must be representative of the population to which the generalizations drawn from the study are intended to apply. All too frequently efforts are devoted almost exclusively to attempting to satisfy the first condition with only casual attention paid to the second. A balanced solution to both conditions is essential. Even if the data for every individual in the study is of the highest reliability, these individuals must be representative of some larger population if generalizations are to be drawn. Similarly, nothing is gained by placing so much emphasis on selecting a representative sample that data of sufficient reliability to answer the hypothesis in question cannot be obtained.

There are no simple methods for determining whether or not a particular sample is representative of some larger population. In general the relationship of a sample to some population may be established in two ways: (a) the population may be defined in advance and a sample chosen by a probability sampling scheme or by purposive selection, or (b) a group of persons may be selected and then the population of which it might be a representative sample is defined by a study of the characteristics of the group and of the method of selection. It is needless here to point out the dangers of purposive selection or to enumerate the advantages of selecting a probability sample other than to point out that the latter is the only method which eliminates personal bias and permits the valid estimation of sampling errors. Unfortunately, in many studies of human populations it is necessary to compromise with the principles of probability sampling. When this is true the investigator must decide

whether this compromise will decrease the generality of the inferences drawn from the sample selected to such an extent that the study would not be worth-while.

5. What biases may arise either as a result of the way the sample was selected or of a failure to obtain information from every person in the sample?

Even with a probability sample, biases may arise due to the refusal or inability of some persons to give information, the failure to find some persons included in the sample and similar reasons. If a nonprobability sample is selected the possibility of bias must be considered even more carefully.

6. How shall a control group be chosen?

Suppose that 70 per cent of a group of persons with cancer of the lung report that they have smoked 10 or more cigarettes daily for at least 15 years. In the absence of information about the smoking habits of persons without cancer of the lung no valid conclusions can be drawn concerning the association between smoking and lung cancer. In other words, a control group is required for comparison with the experimental group. The primary function of controls is to provide a basis for evaluating both the supposed explanation of the observed effect and any alternative explanations.

This type of control group differs in some important respects from the control group in a planned experiment and perhaps might preferably be called a contrasting group. In the simplest type of planned experiment one starts with a sample of individuals from some population and divides this sample into two subsamples by some random or combination of random and systematic processes so that the two subsamples will be equally affected by extraneous factors which may influence the outcome of the experiment. One group is subjected to some condition or treatment while the other, known as the control, is not, and the experimental effect is observed or measured in both groups.

By contrast, the control group in the situation when one goes from effect to cause is a sample of persons who do not exhibit the effect in question. In the example of smoking and lung cancer, the control group would be composed of persons without cancer of the lung. It contains not only persons who have not been subjected to the condition or treatment, in this case smoking, which is suspected of being the cause of the observed effect, but also those who have been subjected to the condition or treatment but who do not show the effect in question, although some may do so in the future. This distinction is important in so far as it has a bearing upon the definition of the population from which the control group is thought to be a representative sample.

The first step in selecting a control group is to clearly define the population of which it is to be a representative sample. This is not necessarily a representative sample of the general population without the effect in question. Morbidity from cancer of the lung, for example, is known to vary with age, sex, and race. Consequently, a group of control cases obtained by taking a simple, random sample of the entire population without cancer of the lung would not furnish a very precise control to say nothing of the practical difficulties of taking it.

In general, the control group should come from a population as similar as possible to that from which the experimental group is chosen. If this is not true, differences between the two groups may, in part at least, be due to the fact that the two groups do not come from the same population. This point should be kept in mind whenever the possibility of using data from the general population to evaluate the results

obtained from an experimental group is being considered. In the smoking and lung cancer problem, the population from which the control group should be a sample is made up of persons who do not have lung cancer but who have been subjected to the same conditions relevant to the development of lung cancer, including the suspected cause, as those who have developed lung cancer. If the control group is selected entirely either from individuals who have never smoked or from individuals each of whom has smoked it is valueless as a contrasting group.

Two situations may arise when the two groups are compared. The supposed cause, for example smoking, may appear only in the group with lung cancer and be absent from the control group. Whenever this occurs, one should investigate whether or not the two groups are in fact samples from the same population before accepting the observed relationship as valid, since a clear-cut difference of this kind is infrequent. More generally, exposure to the supposed cause will be found in the histories of both groups. Evaluation of the relationship between the supposed cause, smoking, and the effect, lung cancer, is based upon the fact that a larger percentage of the lung cancer cases have ever smoked or have smoked more heavily.

This method of judging the possible association between exposure to a supposed hazard and the subsequent development of some condition breaks down when both the control and experimental group report the same degree of exposure. For example, suppose that 100 mice have been injected with a weak carcinogen which in the course of three months induces tumors in 20. A person who knows nothing about the experiment examines the history of the 20 mice with cancer and the 80 mice without cancer. Finding that each mouse in both groups has been exposed to the given agent, he has no basis for assuming that this agent is responsible for the development of cancer. The fact that the suspected agent appears with equal frequency in the history of both groups permits no conclusion concerning the existence or lack of existence of a relationship between it and the observed effect.

In investigations which proceed from effect to cause the experimental group is often chosen by some nonprobability method of sampling, such as taking the first N patients admitted to a particular hospital after a specified date. The characteristics of these persons with respect to factors which might influence the development of the effect being studied is not known until after the interviews are completed; hence, the population of which the control group should be a representative sample cannot be defined in advance. Two methods of selection of the control cases are open to the investigator: (a) matching by pairing and (b) matching without pairing. This will be discussed further in the papers by Greenberg and Cochran in this *Journal*.

7. What other hypotheses might account for the observed effect?

Before it is concluded that an observed association may represent a cause and effect relationship thorough consideration should be given to alternative explanations of the observed effect. In the smoking and lung cancer problem variation in the degree of association with duration and amount of smoking should be investigated. Persons with other forms of cancer, for example cancer of the colon, rectum, or skin could be used as a second control group. However, these should not be used as a substitute for a group of contrasting cases without cancer of any form.

Similarly, in a study of the possible association between injections and poliomyelitis the coincidence of the site of

injection and the part of the body paralyzed, as well as the relationship of the duration between injection and the onset of paralytic poliomyelitis with the known incubation period of the disease, should be analyzed. The control and the experimental group should be compared with respect to a wide variety of characteristics in order to rule out the possibility that some factor other than the one which appears most obvious may account for the apparent relationship. Finally, prior to publication, the manuscript should be given to one's severest critic.

These precautions combined with a thorough knowledge of the subject being studied, clear thinking, and strong skepticism may help to avoid some of the more obvious pitfalls in effect-to-cause investigations. In the last analysis, the validity of an experimental result can be established only by its reproducibility. Reproducibility does not necessarily establish validity, since the same mistake can be made repeatedly, but without reproducibility an experimental result becomes merely an isolated historical event and adds nothing to accumulated scientific knowledge.

Pilot Diabetes Case Finding

The West Virginia Health Department, with the help of a doctor and a nurse assigned from the U. S. Public Health Service for a year, has undertaken a pilot program in diabetes case finding. The purpose is to explore the incidence of diabetes among clinic patients of county health departments, to work out practical ways of referring previously unknown cases for proper medical care, and to find out the cost of a case-finding program.

As a preparation for this study, according to the West Virginia State Health Department's *Health Views*, the State Hygienic Laboratory has developed a practical method of preserving blood for sugar determination so that it will be satisfactory for examination even if specimens take several days to reach the laboratory.

This and the following paper also say "stop, look, and listen" to the researcher in any field of public health who may be less than adequately prepared in statistical method. All three papers are concerned, in general, with the deceptively simple matter of choosing controls, this one marking the pitfalls inherent in pairing or matching.

Matching in Analytical Studies*†

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MOST of the following discussion will be confined to studies in which we compare two populations, which will be called the experimental population and the control population. The experimental population possesses some characteristic (called the experimental factor) the effects of which we wish to investigate: It may consist, for example, of premature infants, of physically handicapped men, of families living in public housing, or of inhabitants of an urban area subject to smoke pollution, the experimental factors being, respectively, prematurity, physical handicaps, public housing, and smoke pollution. I shall suppose that we cannot create the experimental population, but must take it as we find it, except that there may be a choice among several populations that are available for study.

The purpose of the control population is to serve as a standard of comparison by which the effects of the experimental factor are judged. The control population must lack this factor, and ideally it should be similar to the experimental population in anything else that might affect the criterion variables by which the effects of the factor are measured. Occasionally, an ideal control population can be found, but, more usually, even the most suitable control population will still differ from the experimental population in certain properties which are known or suspected to have some correlation with the criterion variables.

When the control and experimental populations have been determined, the only further resource at our disposal is the selection of the control and experimental *samples* which are to form the basis of the investigation. Sometimes this choice is restricted, because the available experimental population is so small that it is necessary to include all its members, only the control population being sampled.

The problem is to conduct the sampling and the statistical analysis of the results so that any consistent differences which appear between the experimental and the control samples can be ascribed with reasonable confidence to the effects of the factor under investigation.

The first step in any matching process is to select those variables (called the covariables) on which the two samples are to be matched. I shall assume for the moment that this decision has been made; the principles in-

* Presented before the Statistics Section of the American Public Health Association at the Eightieth Annual Meeting in Cleveland, Ohio, October 23, 1952.

† Paper No. 288, Department of Biostatistics. Some of the theoretical results used in this paper were obtained under a research contract with the Office of Naval Research.

volved in the decision will be discussed briefly later.

PAIRING

Matching of the experimental and control samples with respect to the covariables can be accomplished in a number of ways. Conceptually, the simplest is the method of pairing. Each member of the experimental sample is taken in turn, and a partner is sought from the control population which has the same values as the experimental member (within defined limits) for each of the covariables. One way of doing this is to perform a multiple classification of the control population by the variables. We then examine the first member of the experimental sample, pick the cell which contains all control members having the desired set of covariables, and choose as the partner one control member at random from this cell. This procedure is repeated for each member of the experimental sample.

If an occasional cell is found to be empty, it is usually preferable to choose the control partner from a neighboring cell, rather than to omit the experimental member. If numerous cells are found to be empty, this is a danger signal. Either the limits of variation allowed in the covariables are too narrow or the control population is not satisfactory.

The analysis of the results is very simple. The difference (experimental-control) is computed for each pair, and any t-tests are applied directly to this series of differences.

EFFECTIVENESS OF PAIRING WHEN WE HAVE AN IDEAL CONTROL

It is difficult to discuss the effectiveness of pairing in realistic terms. The advantages of pairing and of covariance analysis are usually demonstrated by means of a linear regression model. I shall present this analysis, but, as will be seen, there is reason to doubt whether the assumptions in the analysis are valid for many of the studies conducted in practice.

Let y denote the variable by which the effects of the experimental factor are measured, and x denote the covariable, assuming for simplicity that there is only one. The model assumes that y has a linear regression on x with the same slope β in each population. The equations are as follows:

$$\text{Experimental population: } y = \alpha + \beta x + d \quad (1)$$
$$\text{Control population : } y' = \alpha' + \beta x' + d' \quad (2)$$

The variables x and d are independently distributed and the deviations d, d' have means zero in both populations. Further, it is assumed that the means $\bar{X}$, $\bar{X}'$ of x in the two populations are equal, and that $(\alpha - \alpha')$ represents the true effect of the experimental factor, i.e., that no unsuspected biases are present.

In effect, this model postulates that we have been successful in finding an *ideal* control population, since the relation between y and x is the same in both populations and since x has the same average value in both populations.

With this model, the precision given by paired samples can be compared with that given by independent random samples drawn from the two populations. In either method, the effect of the experimnetal factor will be estimated by the difference $(\bar{y} - \bar{y}')$ between the means of the two samples. For the independent samples, each of size n, the variance V_i of $(\bar{y} - \bar{y}')$ is

$$V_i = \frac{2}{n} \sigma_y^2 \quad (3)$$

assuming for simplicity that σ_y is the same in both populations.

With samples paired for x, on the

TABLE 1

Values of $(1 - R^2)$

R	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
$(1 - R^2)$	0.96	0.91	0.84	0.75	0.64	0.51	0.36	0.19

other hand, it follows from equations (1) and (2) that

$$\bar{y} - \bar{y}' = (a - a') + (\bar{d} - \bar{d}')$$

so that the variance V_p of this difference is

$$V_p = \frac{2}{n} \sigma_d^2, \qquad (4)$$

This result may be expressed in a more useful form. From (1),

$$\sigma_y^2 = \beta^2 \sigma_x^2 + \sigma_d^2, \qquad (5)$$

since x and d are assumed independent. If ρ is the correlation coefficient between y and x, then $\beta\sigma_x = \rho\sigma_y$. Thus (5) becomes

$$\sigma_y^2 = \rho^2 \sigma_y^2 + \sigma_d^2$$

giving a well-known result in theory,

$$\sigma_d^2 = \sigma_y^2 (1 - \rho^2)$$

Hence, finally, the variance of $(\bar{y} - \bar{y}')$ for the paired samples may be written, from (4)

$$V_p = \frac{2}{n} \sigma_y^2 (1 - \rho^2) \qquad (6)$$

Comparison with (3) shows that the ratio of V_p to V_i is $(1 - \rho^2)$. A more concrete way of expressing this result is as follows. If n_p, n_i are the respective sample sizes which make the variances *equal* for paired and independent samples, then $n_p = n_i (1 - \rho^2)$. Thus, the ratio $(1 - \rho^2)$ shows how much we can afford to reduce the sample size, when pairing is employed, without any loss of precision.

If pairing is accomplished for several x-variables, all linearly related to y, the ratio becomes $(1 - R^2)$ where R is the multiple correlation coefficient between y and the x's. Values of this factor are shown in Table 1.

The reductions in variance are not large until R reaches 0.5. A reduction by one-half, which corresponds to an allowable reduction of the sample size by one-half, requires $R = 0.7$. Unfortunately, although many published papers have discussed the association between morbidity or mortality and such covariables as age, sex, economic status, family size, and degree of overcrowding, the associations tend to be described in general terms, and little information is available about the actual sizes of the correlations that are to be expected in field studies in public health. With some obvious exceptions (e.g., the association between chronic disease and age) my impression is that the multiple correlation coefficient is often below 0.5, so that the gain in precision from pairing is often modest.

SELECTION OF THE COVARIABLES

Table 1 is also relevant in the selection of the covariables on which the pairing is to be based. It is nearly always possible, with a little effort, to produce a substantial number of x-variables that *might* have some association with y, and this list must be reduced to a few x-variables which will actually be used in pairing. It follows from Table 1 that inclusion of a specific x-variable in the pairing is worth-while only if it decreases $(1 - R^2)$ by an appreciable amount (say 10 per cent), when this x-variable is added to those already selected. Although the practical use of this result requires an intimate knowledge of the relation between y and the x's which is rarely possessed, the

result indicates that associations in which the correlation between a covariable and y is of the order of 0.1 — 0.3 are unlikely to produce useful gains in precision. Thus, in deciding whether to include a covariable, the important question is not "Is there an association?" but "How large is the correlation coefficient?"

PAIRING VERSUS RANDOM SAMPLES WITH COVARIANCE

If, instead of pairing, we draw random samples of size n from each population and adjust the sample means by covariance, then, on the average,

$$V(\bar{y}_{adj} - \bar{y}'_{adj}) = \frac{2}{n}\sigma_y^2(1 - \rho^2)\left\{1 + \frac{1}{2(n-2)}\right\} \quad (7)^*$$

The term in curly brackets represents an increase in variance due to errors in the covariance adjustment. If the covariance adjustment is made for k x-variates, by means of a multiple regression, this term becomes

$$1 + \frac{k}{(2n-k-3)}$$

Provided that the sample size n exceeds $10k$, this factor is close to unity, and covariance gives about the same precision as pairing.

In these circumstances there is not much to choose between pairing and covariance. Pairing has the advantage that the computations are simpler, particularly if the samples are paired on several x-variables. If the regression is nonlinear, pairing will give higher precision than covariance, unless the presence of nonlinearity is recognized in the covariance analysis and we go to the trouble of fitting the appropriate type of regression curve. A difficulty which I have occasionally encountered with covariance is that some scientists have an inborn suspicion of adjustments to the data, and although the adjustments made in the covariance analysis are entirely objective, they may find a rather grudging acceptance.

Pairing has some limitations and disadvantages, the importance of which varies with the type of study. Pairing requires that data on the values of the covariables in the control population be readily accessible; this may not be the case. One disadvantage is the time spent in constructing the pairs. If the experimental sample is small and the control population is large, or if the experimental sample becomes available one member at a time (as with newborn infants or admissions to a hospital) the pairing may be accomplished easily, but it can become tedious if the samples are large and it may impede the progress of the study. A small trial to estimate the time involved in pairing is sometimes advisable. If considerable attrition of the data is expected, as in a long-term follow-up study, the symmetry of pairing is lost. The simplicity of the analysis can be retained only by dropping all partners of "missing" sample members, which involves a loss of information. In order to avoid this loss, it is necessary to use a covariance analysis.

There is one further situation in which pairing may be highly effective. In some studies the experimental population has been drawn from some larger population by a mechanism which operates solely to select certain values of the covariables. For instance, suppose that the experimental population consists of families in public housing in a large city

* This result, which is a slightly different form of Dr. Greenberg's result, assumes that the x-variable is normally distributed in the population, but is approximately true even if x is not normal.

and that these families were selected from a larger population of approved applicants for public housing by some administrative rules. Suppose that the rules give preference to families of veterans and to families of certain sizes (since public housing is built with some preassigned and not necessarily average distribution of family sizes in mind), but are otherwise on a "first come, first served" basis. In this case the approved veteran applicants who are still waiting might constitute a good control population, except that the control and study samples need pairing or matching on family size. (It is not claimed that the selection of entrants to public housing actually operates in this way, the example being intended purely for illustration.)

In a situation of this kind, where x represents family size, the previous regression model might still apply, except that the population mean $\overline{X}$, $\overline{X}'$ now differ. As a result, some difficulty may be experienced in finding control partners for the experimental sample, but if the pairs can be constructed, equation (6) continues to hold for the variance of $(\overline{y} - \overline{y}')$ in the paired samples.

With the covariance method, the corresponding variance may be shown to be approximately

$$V\ (\overline{y}_{adj} - \overline{y}'_{adj}) = \frac{2}{n}\sigma_y^2 (1 - \rho^2) \left\{ 1 + \frac{1}{2\,(n-2)} + \frac{nD^2}{4\,(n-2)\,\sigma_x^2} \right\}$$

where $D = (\overline{X} - \overline{X}')$. The extra term involving D^2 appears because the covariance adjustment, $b(\overline{x} - \overline{x}')$, has become larger, since $\overline{x}$ and $\overline{x}'$ no longer have the same population means. The term in D^2 is almost independent of the sample size n. For $n > 20$, the variance for the covariance method is approximately

$$1 + \frac{D^2}{4\sigma_x^2} \qquad (8)$$

times as large as that given by pairing, so that pairing is more efficient than covariance. The increase in precision from pairing relative to covariance is probably not great in practice. For instance, the variance ratio in (8) equals 1.25 when $D = \sigma_x$, that is when the population means $\overline{X}$, $\overline{X}'$ are distant one standard deviation. This implies a fairly drastic selection operating on the x variable.

If the experimental population involves selection on several x variables, pairing removes the disturbing effects of this selection, provided that *all* the x variables are included in the pairing.

OTHER METHODS OF MATCHING

As we have seen, pairing is most easily done when one of the populations (usually the control population) is large and the samples are small. If the samples are large, pairing may be time consuming, and if the available populations are not much larger than the desired size of samples, pairing may be impossible. In these circumstances, methods of matching which are less thorough deserve consideration.

In the technic known as *balancing*, we do not pair individually, but select the control sample so that its means agree with those of the experimental sample for each of the covariables. Balancing can usually be carried out more quickly than pairing; it gives the same precision as pairing if the regression of y on the covariables is linear, although balancing is less precise if the regression

is nonlinear. As Dr. Greenberg states in his article, balancing requires the use of a covariance analysis in order to perform tests of significance—a point which has often been overlooked.

Another method of obtaining a less rigorous matching is to divide the range of any covariable into three or four classes. Thus, if matching is being done for three covariables, the number of cells produced will lie somewhere between 27 and 64 (some of which may empty). The sample from any cell in the experimental population is drawn at random, and its size is proportional to the number of entries in the cell. The sample from any cell in the control sample is also drawn at random and is made to be the same size as that for the corresponding cell in the experimental sample. If International Business Machines' equipment is used and the samples are large, this method, sometimes called *stratified matching*, is more expeditious than pairing, because it requires a much less detailed breakdown of the population into cells. It is less precise than pairing, since the covariables do not have exactly the same set of values in the control and experimental samples. However, with at least three classes for any covariable, it may be shown by theory that the loss precision is small unless the multiple correlation coefficient exceeds about 0.7. The analysis of the results is slightly more complicated, because we can compare the experimental and control results separately for each cell. In return, this analysis focuses attention on any variation that occurs in the effects of the experimental factor as the levels of the covariables change—in other words, on the interactions of the experimental factor with the covariables. Such information may broaden the results of the study.

There are several variants of this method. For instance, if there is particular interest in interactions, the samples from each cell may be made equal so far as is feasible.

The experimental and control samples need not be the same size. With pairing, we could select r control partners for each member of the experimental sample. The factor $2/n$ in the variance of the mean difference is then reduced to $(r + 1)/rn$. The cost of the study is, of course, increased, but the device may be profitable when the experimental sample is small and the cost of obtaining and processing the control data is not prohibitive.

SITUATION WHEN THE CONTROL POPULATION IS NOT IDEAL

It is worth reiterating that the previous discussion of the effectiveness of matching or covariance assumes that the control population is ideal, in the sense that the control and experimental populations differ at most through selection on certain covariables which are included in the matching or covariance.

When the two populations differ in other ways, we do not know how effective matching is. It is almost certain to be less effective than when the control population is ideal, and it may be practically ineffective. What is likely to happen is that the regressions of y on the covariables will differ in the two populations. In this event, matching no longer removes all the disturbing effects of the covariables on which we match. Further, there are likely to be other variables with respect to which the populations differ. In so far as these variables are uncorrelated with the matching covariables, their disturbing effects are unchanged by matching. The net result is that the difference between the means of the matched samples is a biased estimate of the effects of the experimental factor. The bias can be expected to be smaller with matched than with unmatched samples, but it may be only slightly smaller.

DISCUSSION AND SUMMARY

The principal conclusion from the preceding discussion is that the selection of the control population is a more crucial step than the selection of a method of matching or of the covariables on which to match. Matching removes the deficiencies of a poor control to only a limited extent.

In turn, this suggests that, whenever feasible, any study should start with a comparison of the experimental and control populations. This is by no means the rule in practice. Frequently, the experimental sample is chosen first and the control population is then searched in order to find the partners. If partners seem hard to find, some misgivings about the control population may arise, but if the pairs can be found, sometimes by selecting an extreme sample from the control population, the study proceeds. This kind of matching may leave us with a control population that does not resemble the study population and a control sample that is a very extreme sample from the control population.

The kind of comparison which I am recommending was conducted by Densen, *et al.*,[1] as a preliminary to a proposed study on the penicillin treatment of cardiovascular syphilis. From hospital records, it was planned to select a sample of patients who had not received penicillin as a control for an experimental sample of patients who had been treated with penicillin. In a comparison of the available patients from two hospitals, Densen, *et al.*, found many differences between the experimental and control cases and concluded that any matching process would be hard to carry out and that its results would be suspect.

A comparison of this kind does not provide proof that the control population is ideal, since only the covariables can be studied, but not their relations with y. If, however, a number of covariables are included, it is reassuring to find agreement, or at most minor disagreement, between the two populations on all these covariables. Where more substantial discrepancies appear, their implications as to the suitability of the control can be considered.

If the control population appears satisfactory, the next step is to select the covariables to be used in matching. At this point any available information about the sizes of the correlations between y and the x's is relevant. Since my impression is that these correlations are frequently low in public health field studies, with some obvious exceptions, my recommendation, in cases of doubt, is to omit an x-variable from the matching rather than to include it. Covariance adjustments can be made should this variable later prove important.

If the samples are small and at least one of the populations is large, so that pairing is not too laborious, pairing has much to recommend it. If the samples are large, stratified matching may be preferable. If the samples are not much smaller than the available populations, random samples should be drawn and covariance adjustments applied.

In conclusion, in observational studies, where it is not feasible to assign a subject at random to the control or experimental sample, we can never be sure that some unsuspected disturbance does not account, in large part, for the observed difference between the two samples. Consequently, the results of tests of significance must be interpreted with more caution in observational studies than in experiments where randomization can be employed. One good practice in observational studies is to check any theory at as many points and in as many ways as ingenuity can devise. An illustration occurs in a study of the relation between inoculation with pertussis vaccine and poliomyelitis, reported by Hill and Knowelden.[2] The experimental sample consisted of children with poliomyelitis and the control sample of

children without poliomyelitis, paired for age and sex and living in the same area. The experimental sample showed a marked excess of inoculations during the month preceding onset of poliomyelitis, but no excess of inoculations at intervals larger than a month. Second, during the month preceding onset, paralysis occurred at the site of inoculation in the great majority of cases, but with the interval larger than a month, the site of inoculation was involved in paralysis in only a small minority of cases. The point is that these two independent results greatly strengthen the evidence for a causal relationship. If the same kind of result appears repeatedly when the data are analyzed from widely different points of view, it becomes successively more difficult to imagine any "disturbance" that will explain away *all* the results. Where it can be employed, this technic does much to overcome the handicap under which we all labor in observational studies.

REFERENCES

1. Densen, P. M., et al. Studies in Cardiovascular Syphilis II. Methodologic Problems in the Evaluation of Therapy. *Am. J. Syp., Gonor. & Ven. Dis.* 36, 1:64–76 (Jan.), 1952.
2. Hill, A. Bradford, and Knowelden, J. Inoculation and Poliomyelitis. A Statistical Investigation in England and Wales in 1949. *Brit. M. J.* ii:1 (July), 1950.

The Journal 25 Years Ago

TERMINAL DISINFECTION

Terminal disinfection which was discontinued by Charles V. Chapin, M.D., for certain communicable diseases in the City of Providence as early as 1905, was nevertheless still inveighed against in the *Journal* nearly a quarter of a century ago. Inspired by a survey and report on disinfection as practiced in various countries by Dr. Carlos Chagas of the Office International d'Hygiene Publique, an editorial takes pride in the fact that "as far as our knowledge goes. Dr. Chapin preceded all others in these ideas and in the practical demonstration of their soundness; but we welcome the clear presentation given by Dr. Chagas in corroboration of what we have believed and practiced for a number of years."

Dr. Chagas's report had indicated that terminal disinfection was almost always useless, based on incorrect ideas, and the results not commensurate with the expense. Conclusions reached, the editor says, by Dr. Chapin and others many years ago. (*A.J.P.H.* 18, 9:1132 (Sept.), 1928.)

What to do about the covariables that complicate almost every statistical comparison is the message of the last of three related papers. Perhaps its discussion of the permissible number of covariables is its most pertinent reminder for the nonstatistical researcher.

The Use of Analysis of Covariance and Balancing in Analytical Surveys*

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SPECIFIC differences in mortality, morbidity, and other characteristics may be observed to occur in surveys of population groups. Before concluding that the occurrence of a difference in one of those variables can be ascribed to the factor(s) used in classifying the populations, it is important to investigate the composition of the populations with respect to other attributes related to that particular variable. For example, does a population of nonsmokers have less lung cancer than a population of smokers because of smoking habits, or is the former group less prone to develop lung cancer because of age, race, sex, socioeconomic, and occupational differences? Similarly, is the nutritional status of one racial group better than that of another because of real differences in food habits, or is it a reflection of the pattern of cash income? Is the mortality experience of community A lower than that of community B because of differing health conditions and facilities in the two areas, or does it merely indicate a difference related to the age, race, and sex distributions?

The comparison of two groups which are essentially alike in every detail except the one being tested is an ideal which is usually unattainable. This condition is probably inevitable since every individual in a population has multiple possible measurements each of which may contribute, in varying degrees, to produce the observable effect. Uncontrolled and associated variables are always present when population groups are studied, and the research worker in public health must be prepared to deal with variations in the above mentioned attributes as well as with differences in educational level, height, weight, birthweight, order of birth, period of gestation, amount of nutrient consumed, number of previous inoculations, or an almost infinite variety of other possibilities.

This problem is not uniquely limited to analytical surveys. Even in planned experiments † where a group of valid controls may have to be constructed, the presence of many variables other than the one under immediate consideration becomes a complicating factor. The associated variables are referred to in

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* Presented before the Statistics Section of the American Public Health Association at the Eightieth Annual Meeting in Cleveland, Ohio, October 23, 1952.

† A planned experiment is distinguished from an analytical survey here by defining the former to include only those cases in which subjects can be assigned at random to treatment groups and the response is observed from a sequence of events progressing forward in time.

such cases as concomitant ones or covariables. Technics developed in experimental design to determine whether observed differences between experimental and control groups are due to differing treatments, the covariables, or both, will be found to be useful in the present problem.

In planned experiments, one technic used is to assign subjects at random to treatment groups in the hope that bias will be avoided from these associated sources of variation, known or unknown. But in such instances, it is impractical (and sometimes impossible) to expect randomization procedures to cancel the full impact of all covariables.* In surveys, furthermore, there may not be any opportunity for randomization of subjects to treatment or population groups since the latter already exist. The only freedom of design present is concerned with the sampling process.

When the number of observations at hand is large, however, one can sometimes solve this problem by dividing the data into several homogeneous subgroups and dealing with each of them individually. For example, when age, race, and sex are concomitant variables needing consideration, comparisons between treatment or population groups might be made separately for white males, ages 5–9, 10–14, 15–19, etc.

There are several objections to this type of analysis.

1. When the covariable is a continuous one, such as age, subdivision involves arbitrary decisions for grouping.
2. In most public health problems, numerous observations are not always possible because of the nature of the event. There is a limited frequency of occurrence of certain deaths, diseases, and conditions.
3. Subdivision into small homogeneous groups involves samples larger than may be needed to measure an over-all effect. This is inefficient and costly.

* Randomization will ordinarily remove the bias but not the accompanying variability produced by the associated variables.

How, then, are these other variables efficiently dealt with so as to eliminate or adjust for their effects upon the measurement under study? A recommended procedure for treating them is called analysis of covariance. It is perhaps expedient to illustrate its use by an example. The illustration will also serve to bring out the assumptions involved in the method.

EXAMPLE

The data for the present example are from a section of a larger study in nutrition, part of which has been reported elsewhere.[1] At one point in that investigation, the question was raised whether the sample of 9- through 11-year-old children in a private urban school were taller than children in the same grades in a rural school. The children reported here from the rural school include only those whose parents were classified as tenant farmers. The data in Table 1 were available to answer this particular question.

The data for the present example involve a main variable (height) and a covariable (age) which are both quantitative, continuous measurements. The technic of covariance may also be extended to cover cases where some of the variables are qualitative and discontinuous.

Although the sample of children for the private school appears to be taller by $(144.5–141.7) = 2.8$ cm., this difference is not significant since the t-test yields a value of 1.06. On the other hand, examination of the ages of the two groups being compared shows that the rural school children in this sample are about one-half year older on the average. Taking this fact into consideration with the observed height difference might provide a new light on the difference in stature.

ANALYSIS OF COVARIANCE

Analysis of covariance is a recom-

TABLE 1

Height and Age of Private and Rural School Children in a Study in North Carolina in 1948

	Private School		Rural School	
Students	*Age (x) (months)*	*Height (y) (cm.)*	*Age (x) (months)*	*Height (y) (cm.)*
1	109	137.6	121	139.0
2	113	147.8	121	140.9
3	115	136.8	128	134.9
4	116	140.7	129	149.5
5	119	132.7	131	148.7
6	120	145.4	132	131.0
7	121	135.0	133	142.3
8	124	133.0	134	139.9
9	126	148.5	138	142.9
10	129	148.3	138	147.7
11	130	147.5	138	147.7
12	133	148.8	140	134.6
13	134	133.2	140	135.8
14	135	148.7	140	148.5
15	137	152.0	..	..
16	139	150.6	..	..
17	141	165.3	..	..
18	142	149.9	..	..
Total	2,283	2,601.8	1,953	1,983.4
Mean	126.8	144.5	133.1	141.7
Sums of squares	291,331	377,329.00	248,469	281,478.10
Sums of squares of deviations	1,770.50	1,253.26	556.93	486.99
Sum of products	330,900.20		263,996.20	
Sum of products of deviations	905.23		62.33	

mended method of taking this age difference into account in order to compare stature. The procedure involves a combination of analysis of variance and standard regression technics.

The fact that the children differ in ages has introduced two limitations on the use of the straightforward t-test above.

The first has already been pointed out, viz., that the rural children are older by one-half year. The second and more important one is that the estimate of the standard error of the difference in height used in the preliminary test of significance was inflated because of the varying ages of children in those grades.

To consider the latter limitation first, a more valid estimate of this error can be obtained by measuring deviations from a fitted regression line of height on age instead of the average height in each school. In that way, the rural school child who is, say 140 months old, can be compared in height with an expected height for children of that age (Figure 1) rather than the observed average for the entire group of 9- through 11-year-old children, which was 141.7 cm.

The calculations for this procedure are outlined in Table 2 and will be discussed briefly here. It will be assumed that the steps for converting the data from Table 1 to the form indicated in the left hand side of Table 2, if not readily apparent, can be comprehended by consulting a good text on statistical methods (e.g., see Snedecor [2]).

The preliminary t-test employed the value of 1,740.25 in deriving an estimate of error, this term coming from the "Within schools" line for S_y^2 in Table 2. As pointed out, this term is based upon deviations from the mean in each school. A more valid estimate of error is ob-

TABLE 2

Analysis of Covariance of Stature of Children in Two Schools

Source of Variation	Degrees of Freedom	Sums of Squares and Products			Errors of Estimate		
		Sy^2	Sxy	Sx^2	Adjusted Sum of Squares *	Degrees of Freedom	Mean Square
Total	31	1,805.25	826.42	2,633.87	1,545.95	30	
Between schools	1	65.00	−141.14	306.44			
Within schools	30	1,740.25	967.56	2,327.43	1,338.02	29	46.14
For test of significance of adjusted means					207.93	1	207.93

$$F = \frac{207.93}{46.14} = 4.51$$

* $Sy^2 - \frac{(Sxy)^2}{Sx^2}$

tained if deviations are measured from the regression lines of height on age in each school. When this is done, the adjusted sum of squares is obtained, the result being equal to 1,338.02. This calculation was designed, therefore, to derive a proper estimate of error to be used in the denominator of the F-test.

The fact that the rural children were slightly older is taken into account when the numerator for the F-test is calculated. It is obtained from the difference between the total adjusted sum of squares and the previously calculated "Within schools" value, i.e.:

$$1{,}549.45 - 1{,}338.02 = 207.93$$

The test of significance is then significant at the 5 per cent level since the F value is 4.51.

The estimated difference in stature between the two schools, if age is adjusted to the same age for both groups, is represented by the vertical difference between the two parallel lines shown in Figure 1. This difference can be calculated as follows:

Private school adjusted mean height	$= 144.5 - 0.42\ (126.8 - 129.6)$	$= 145.7$
Rural school adjusted mean height	$= 141.7 - 0.42\ (133.1 - 129.6)$	$= 140.2$
Difference		$= 5.5$

Where $0.42 = \frac{967.56}{2{,}327.43}$ = common slope of the regression lines of height on age; 129.6 is the mean age of the 32 students from both schools and remaining values are mean heights and ages as reported in Table 1.

The adjustments calculated by the foregoing are represented graphically in Figure 1. Thus, the unadjusted mean height of private school children at point A is transferred to point B. Similarly, the unadjusted mean height of rural children at point C is adjusted to point D. Points B and D are at the average age of all 32 children and there is 5.5 cm. separating these two points.

SPECIAL ASSUMPTIONS UNDERLYING ANALYSIS OF COVARIANCE

In addition to the usual assumptions underlying the analysis of variance,[3] additional ones are introduced here because of the application of regression procedures. These are as follows:

1. *Linearity of regression of height on age*—The appropriateness of assuming

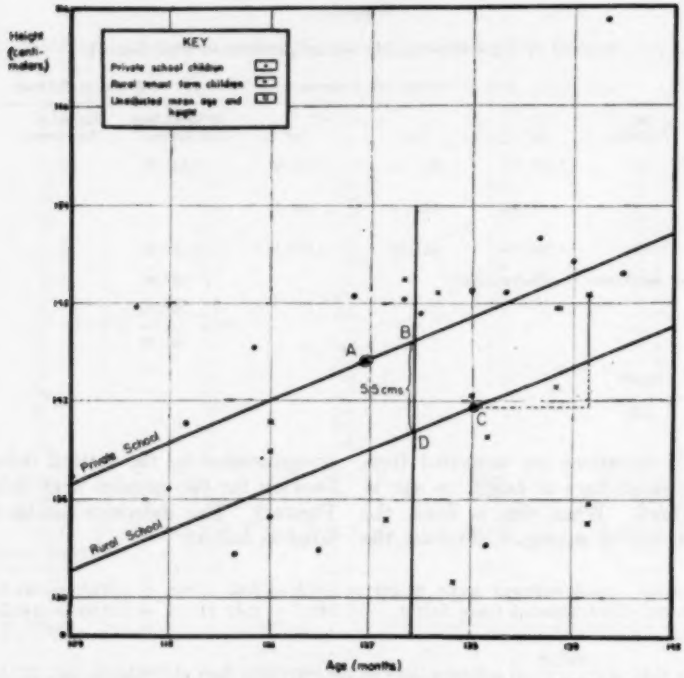

FIGURE 1—Height and Age of Private and Rural School Children in a Study in North Carolina in 1948.

that a straight line relationship exists between height and age should be investigated. For the relatively small interval of three years involved here, departure from linearity does not appear to be a serious shortcoming. For large ranges in age, however, the linearity of the regression should be reviewed and evaluated.

The technic of covariance is by no means restricted to applications where the regression is linear. Even though the relationship might assume a non-linear form of mathematical curve, adjustments can still be made. This may involve, however, additional calculations similar to the use of more than one covariable. (See below for discussion of several covariables.)

2. *Similarity of regression slopes for each school*—It can be seen in Figure 1, that the deviations in each school are measured from two parallel lines. That is to say, the lines were determined so as to have the same slope. This assumption is necessary if there is to be a constant differential in stature between the two groups over the entire age range. If the two slopes are not identical, then the children in one school might be taller at age 9 but smaller at age 11.

The parallelism of the lines should be tested in every instance. The details of this test will not be discussed here. The test, nevertheless, was performed in this example and the departure from parallelism was not significant.

3. *Homogeneity of variances*—As in other applications of elementary regression technics, it is assumed that the

deviations about the line at age 9 are of the same order of magnitude as those at ages 10 and 11. From the growth-curve literature (Burgess [4]), it is known that this is not completely true. The degree to which it is not, however, is slight in this example and not serious enough to invalidate the inferences. For information on handling situations involving heterogeneity of variances, see Cochran [5] and Bartlett.[6]

4. *Overlapping of ages in both groups* —If the mean ages in the two groups are far apart, adjustment of the mean heights to points B and D at the point of over-all mean height may represent extrapolation. The uncertainties of extrapolation are greater in covariance analysis than in the usual case of regression since it is performed twice. In this example, there was considerable overlapping of the age distributions and no trouble was encountered on that score.

SEVERAL COVARIABLES

The use of more than one concomitant variable is frequently necessary to achieve desired results, particularly to obtain a valid estimate of error. The analysis of covariance permits the use of any number of covariables, provided it is less than the number of degrees of freedom in error.

The question of how many variables to include is identical to that which arises in most multiple regression problems. The decision depends upon a comparison of the expected gain in efficiency versus the cost of gathering that information and performing the additional calculations. Generally speaking, if the partial correlation coefficient of $r_{yx_p \cdot x_1 x_2 \ldots x_{p-1}}$ is significantly different from zero, the inclusion of variable X_p (in addition to X_1, X_2, ... X_{p-1}) will reduce the magnitude of the denominator in the F-test.

BALANCING

In most planned experiments, the investigator has the opportunity of arranging the subjects so that the average ages, say, in the two groups are the same. This method of design has intuitive as well as popular appeal and is well known in some branches of research as *matching of groups* or *balancing*.*

If balancing has value in planned experimentation, it appears at first glance that matching of groups might also be helpful in analytical surveys. The investigator can choose samples in such a way that the average values of the covariables are identical, or nearly so, by restricting the random element in the sampling procedure (e.g., stratified sampling in several stages). For example, a segment from each of two populations might be chosen so that both samples contain the same percentage of males.

If this is a true probability sample for a finite population, use of the correct estimation technic would weight the estimate of the main variable under study according to the true sex ratio in each population and nothing will have been gained.

If interest is centered upon an infinite population, does matching of groups produce a worth-while result? Generally in public health problems, I think not. The justification for this can be demon-

* The procedure of balancing is a tricky one if a random element in the sample is to be retained. In the case where subjects are available before the experiment is started, and they are to be assigned to either an experimental or control treatment group, a recommended procedure for matching the two groups with respect to a covariable is as follows:

Arrange the subjects according to the magnitude of the covariable to be balanced. There are many ways in which the individuals can now be grouped from this linear arrangement so that the term t_{xx} in expression (A) above is small. In many cases, one of the most advantageous groupings is to proceed in units of four subjects. The first of each unit of four persons is assigned at random to either the experimental or control treatment. Having made this initial random allocation, the following two individuals are assigned to the opposite treatment. Finally, the fourth individual is assigned to the same treatment as the first person. Repeat the identical procedure, including randomization, for each unit of four. The sequence appears as a sandwich of four which in symbolic notation can be written as ABBA.

strated by examining the claimed advantages of balancing in planned experiments.

When balancing is used, the reasoning goes that there is no need for adjustment of the covariables by covariance since the two distributions, or at least the first moments of the two distributions, are identical. Unfortunately, this logic is not quite true. Even if one assumes that the relationship is exactly linear so that equivalence of the means is all that is needed, matching of the treatment groups has done nothing about the error term, the denominator of the F-test. In this respect, covariance analysis is of much more value for it enables a valid estimate of the error term to be made.

It so happens, nevertheless, that when covariance analysis is used, there is still a slight additional gain to be achieved in the sensitivity of an experiment by balancing. This gain stems from the effect of balancing upon the numerator of the F-test.

If an equal number of subjects have been allocated to each treatment group at random, it can be shown that the average or expected value of the numerator of the F-ratio in the analysis of covariance is equal to *

$$\text{(A)} \qquad \sigma^2 + n\left\{1 - \frac{t_{xx}}{(p\text{-}1)\ S_{xx}}\right\} \Delta_t^2 ,$$

where σ^2 = true experimental error
n = number of subjects on each treatment
p = number of treatments
t_{xx} = symbol for the sum of squares represented by 306.44 in the present example
S_{xx} = symbol for the sum of squares represented by 2,633.87 in the present example
$(p\text{-}1)\ \Delta_t^2$ = sum of squares of the true treatment effects

* It has been assumed that the true mean of the covariable is identical in each of the treatment groups.

The sensitivity or discriminatory power of a given experiment can be enhanced by maximizing the numerator of the F-ratio, or making $\frac{t_{xx}}{(p\text{-}1)\ S_{xx}}$ as small as possible. The effect of balancing is to make t_{xx} essentially equal to zero.

The term $\frac{t_{xx}}{(p\text{-}1)\ S_{xx}}$ has therefore been suggested by Lucas [7] as a measure of the loss in sensitivity due to failure to balance. It has an average or expected value equal to $\frac{1}{np-1}$. Also, 95 per cent upper limits for the loss in sensitivity due to failure to balance can be calculated. These values have been calculated in Table 3 for the special case where $p = 2$. It can be seen that the sensitivity loss is trivial (0.05) when there are about 20 subjects in all and only two treatments. With less than that many subjects, the loss becomes more substantial.

TABLE 3

Loss in Sensitivity of an Experiment with Two Treatments Due to Failure to Balance

No. of Subjects on Each Treatment	*Average Loss in Sensitivity*	*Five Per cent of Time Loss in Sensitivity Exceeds*
2	0.33	0.90
3	0.20	0.66
4	0.14	0.50
..	..	..
..	..	..
..	..	..
10	0.05	0.20
20	0.03	0.09
30	0.02	0.06
40	0.01	0.06

Thus, in cases where covariables exist, the preferred procedure is always covariance analysis. If the study consists of less than 10 subjects on each of two treatments, a slight gain in efficiency may be obtained by the technic of balancing.

SUMMARY

In drawing inferences from surveys of population groups, it has been demonstrated how the effect of covariables upon the measurement under study can be taken into account by the use of covariance analysis. The assumptions underlying the use of the method were pointed out.

The advantage of balancing or matching of groups with respect to a covariable has been compared with that of covariance. The latter is the preferred procedure, since it enables a valid estimate of error to be made as well as removing any bias. In addition to covariance, however, balancing has further merit when surveys involve less than 10 subjects on each of two treatment groups. If many covariables exist, covariance analysis may be inconvenient to use for all of them, in which case balancing of the remainder will usually remove a considerable portion of the bias.

REFERENCES

1. Bryan, A. Hughes, and Greenberg, B. G. Methods for Studying the Influence of Socio-economic Factors on the Growth of School Children—Body Measurements. *J. Elisha Mitchell Scientific Soc.* 65:311–314 (Dec.), 1949.
2. Snedecor, George. *Statistical Methods.* Ames, Ia.: Iowa State College Press, 1946.
3. Eisenhart, Churchill. The Assumptions Underlying the Analysis of Variance. *Biometrics* 3:1–21 (Mar.), 1947.
4. Burgess, May Ayres. The Construction of Two Height Charts. *J. Am. Statist. A.* 32:290–310, 1937.
5. Cochran, W. G. Some Consequences When the Assumptions for the Analysis of Variance Are Not Satisfied. *Biometrics* 3:22–38 (Mar.), 1947.
6. Bartlett, M. S. The Use of Transformations. *Ibid.* 3:39–52 (Mar.), 1947.
7. Lucas, Henry L., Jr. *Design and Analysis of Feeding Experiments With Milking Dairy Cattle.* Raleigh, N. C.: Institute of Statistics Mimeograph Series No. 18.

Medical Health Officer Examination

The U. S. Civil Service Commission announces an examination for medical officers to fill positions in various specialized fields, with salaries ranging from $5,940 to $10,800. The positions are principally in the Bureau of Indian Affairs located on reservations west of the Mississippi and in Alaska with a few positions in the Fish and Wild Life Service. Further information from U. S. Civil Service Commission, Washington 25, D. C.

As the nation-wide program for fluoridating public water supplies progresses—despite sometimes formidable opposition—it is helpful to return on occasion to first principles. Here is a brief recounting of the beginnings of fluoridation. It becomes a document of high educational worth.

An Appraisal of the Water-Borne Fluoride—Dental Caries Relationship*

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IT is not necessary to remind more than a portion of the readers that the study of what was originally known as "mottled enamel" established the two basic facts upon which the practice of water fluoridation now rests.

These are, first, that "mottled enamel" is produced by an ingredient of the domestic water supply, and second, that the rate of caries experience in mottled teeth is invariably low. What is signified by the term "low" will be apparent later in this paper.

Since the cause of "mottled enamel" has been determined to be high fluoride concentration in the domestic water supply, it is now more properly called dental fluorosis or fluorosed enamel. It is apparent that fluorosed enamel has been endowed with some property against which the initial caries attack is comparatively ineffective.

During the early years the investigation concerned itself with little more than locating and examining areas in which dental fluorosis was endemic, in the hope that some common factor could be found that would reveal the cause.

Because of the disfiguring appearance in the pronounced cases, the prime purpose during those early years was to find a means of prevention. The low rate of caries experience associated with mottled enamel was not recognized until many years later, a circumstance that I do not chronicle with any degree of pride.

This very brief introduction brings us to the discovery in 1931 of water-borne fluoride as the causative agent.

The U. S. Public Health Service entered the study at about that time and with the raw material previously collected, with fluoride as the key factor, those master craftsmen have built the magnificent structure we have today.

They studied the water supplies of the endemic districts, determined their fluoride contents, established the relation between the fluoride content and the caries experience rates, compared these rates as between fluoride and non-fluoride districts, and determined the correct amount of fluoride that would confer protection against caries without producing a disfiguring dental fluorosis. Surely a magnificent achievement!

But, without a practical application, this knowledge would be little more than academic. I shall not dwell in detail with the installation of the first demonstration plants beginning in 1945, in which fluoride was added in controlled

* Presented before a Joint Session of the American School Health Association, the Conference for Health Council Work, and the Dental Health, Public Health Education, and Public Health Nursing Sections of the American Public Health Association at the Eightieth Annual Meeting in Cleveland, Ohio, October 23, 1952.

amounts to water systems, in a manner calculated to duplicate the condition that existed in naturally fluoridized water and which, by all logic, would produce the same condition found there in the teeth of native children.

This, we readily admit, was uncharted ground to explore and took courage and great faith, and there is little need to dwell here on the results that after a sufficient number of years have become apparent, but only to say, that not only have they met, but have exceeded expectations. The courage of these pioneer installers and indeed of all who have urged and endorsed fluoridation has ample support in the fact that no problem in epidemiology has ever had so much supporting evidence as has the action of fluoride in the prevention of dental caries.

In the vast number of communities in this country alone, using naturally fluoridized water, not one, so far examined, has failed to show a low average rate of caries experience. The examinations and studies that have established the fluoride-dental caries relationship have conformed rigidly with all the accepted criteria of scientific methods and have been supported by statistical evidence in abundance. Valuable as these are for analysis by the scientific approach, a plain statement is easier for general comprehension.

Let me offer now such a statement that will show the actual condition as to the caries experience rate in a certain community, in which naturally fluoridized water has been in continuous use for about 70 years.

During the past six or seven years and up to the present time, 511 native persons of an average age of about 25 years have been observed and the conditions charted. Thirty-six per cent were totally free of any caries experience; the average number of carious and filled teeth per person was 2.6 and the average number of teeth lost by caries per person was less than two-hundredths of a tooth.

In these 511 persons there were only 55 carious areas in the anterior teeth. It has been pointed out previously that caries in fluorosed teeth is practically limited to pits and fissures and that caries in the anterior teeth is almost negligible. Rampant caries, as generally understood, is practically unknown.

Valuable information is derived also from migratory persons whose teeth are fluorosed. Records made during that same period of time from 223 of these show conditions only fractionally different from the natives described previously.

The inference is clear that the influence of fluoride once conferred is not diminished through later migrations outside of fluoride territory. To eventually achieve such a prevailing caries experience rate is, it seems to me, the ultimate objective in fluoridating the water supply of any community; the year by year improvement over the prefluoridation rate can be properly expressed by a percentage measurement.

Through experience in observation there is general agreement that a fluoride content of around 1.0 ppm is not likely to produce a visible dental fluorosis except possibly in a very few individuals and then in a very mild form. This term "visible" fluorosis needs explanation. It was coined, of necessity, during an examination of the school population of the small city of Salida, Colorado, population 6,000, by Downs, Frisch and McKay in 1947. The water system which had been in use for thirty years had a natural fluoride content of 1.3 ppm which is just about the ideal amount.

To elaborate briefly on this survey, examinations were made of 414 natives of continuous residence and 327 migrants who had acquired dental fluorosis elsewhere—a total of 741 persons.

Forty-one per cent of the combined groups were entirely free of any caries experience whatever.

In a group of 108 natives in the 12- 13- and 14-year age range almost 54 per cent had had no caries experience and the average number of decayed, filled and extracted teeth per person was 1.19.

In the 15- 16- and 17-year age group of 97 natives, 40.2 per cent were caries free and the average number of decayed, filled and extracted teeth per person was 2.0.

Contrasting this with Madison, Wis., as typical of a fluoride-free community with a caries experience rate of 11.16 in 160 persons in the same age group, the Madison rate was five and one-half times that of Salida. Madison has since fluoridated its water supply.

There were very many of these native children of continuous residence in Salida in whom the most careful examination could reveal no signs of fluorosis. In recording such cases it was necessary to indicate that the degree of fluorosis was so slight as to be "not visible."

A point of extreme importance is that this "not visible" fluorosis has a caries resistance equal to that of a visible fluorosis.

At this Salida examination it was recognized for the first time within my experience that these mildly fluorosed teeth had a lustre, sheen, and beauty peculiar to themselves. This observation was made at the time by the late Dr. John G. Frisch.

The same observation has been made and commented upon in examinations elsewhere, notably at Sheboygan, Wis., with reference to teeth formed there subsequent to fluoridation of the water system in 1945.

Observation has generally confirmed that when the fluoride content is at or above 2.0 ppm fluorosis of even an extremely disfiguring degree can be produced, but even in these, the caries experience rate may be and often is low. On the other hand, there are unexpectedly persons who have used water containing 2.0 ppm or even higher with no visible fluorosis and a low caries experience rate. For these wide individual differences there is no apparent explanation.

Prior to the fluoride era the studies of caries occurrence and of measures for its prevention have been concerned chiefly with the environment of the teeth and with methods of altering it. It is evident now that the action of fluoride has created a new and different type of enamel structure, one that was not known to us before, which in itself contains the factor that determines the caries experience rate.

There was a momentous satisfaction in announcing to the dental profession, health workers, and to the public that, for the first time, there was an effective means available for the mass control of dental caries through water fluoridation, and it was anticipated that so substantial a measure of relief would be received with gratitude and enthusiasm; and so it was.

However, no appraisal of this achievement would be complete without reference to the objections that have been so vociferously advanced.

It is astonishing that a project so beneficent has drawn such individual and organized denunciation and from so many standpoints, but in an honest difference of opinion there is always an open possibility of harmonizing conflicting viewpoints by presentation of the facts.

The fluoridation of water supplies has been termed an "experiment"; hence, it is urged there should be a period of "waiting."

The action of fluoride on forming tooth enamel never was an experiment. The same result has been produced ever since fluoride first came into contact with

forming enamel; hence, it is a law in nature and, I believe, it is true to say that no law in nature ever was or ever can be an experiment. It was in operation long before the investigators came into the scene. They merely discovered this natural law and are now seeking to apply it.

A vast population in this country alone has been consuming naturally fluoridized water for generations and in entire unawareness. The acceptance of such naturally fluoridized water, often far in excess of the 1.0 ppm advocated, but rejecting 1.0 ppm fluoride when added by the hand of man is a species of logic dangerously approaching sophistry.

It is known that a great many of the foods consumed by all of us contain very appreciable amounts of fluoride. The innocuous cup of tea is an infusion that contains from 30 to 60 ppm fluoride—30 to 60 times the amount recommended in water fluoridation.

At the inauguration of the first demonstration projects the tenure was arbitrarily set at 10 to 12 years, a period of time thought necessary to produce the desired information. Within three to five or six years since fluoridation began, particularly in reference to Madison and Sheboygan, Wis., and Grand Rapids, Mich., an appreciable reduction in the caries experience rate has become measurably apparent.

What additional information can be expected from any demonstration project that would justify deferring the final stamp of approval for another period of years?

Objections to fluoride ingestion from water supplies as productive of various pathoses have had no support beyond vague "might be" or "could be" or "we don't know" expressions.

The best informed scientific opinion available is emphatic in declaring that there is no submitted evidence of any pathoses associated with such fluoride ingestion.

The evidence upon which fluoridation is based was collected under the strictest methods, rigidly screened and digested, and published with an eye to its accuracy.

Objections can become valid only after similar supporting studies have been made, with equal thoroughness and accuracy and published.

In the June, 1952, issue of the *Journal of the American Water Works Association* a table appears showing what an immense population in this country is served by water supplies having various fluoride levels. Another table shows that in 23 states there is a population of almost 300,000 served by 112 water works systems, some of which carry a fluoride content of 3.0 ppm or more. It is certain that within that population there are specific communities where water of this high fluoride content has been in long continuous use.

It is here suggested to the opposition that any one of these cities would be an admirable place in which to determine exactly what fluoride induced pathoses exist and to describe their nature. That would go a long way toward eliminating the "might be's" and the "could be's," and no one would be more interested in gaining this information than the proponents of water fluoridation.

In conclusion, when the rapidly expanding practice of water fluoridation has reached the general distribution that is likely in the foreseeable future, dentistry will have advanced well within striking distance toward control of the damage to and loss of the teeth by caries.

Starting as an epidemiologic inquiry into a dental disease, water fluoride studies moved into areas of research then remote from oral hygiene. Chemistry, engineering, physiology, biometry, and pharmacology were some of the disciplines recruited to help clear away the newly opened pathway to dental health. Today electron microscopy and diffraction add new tools for the exploratory job not yet completed.

Some Reflections on the Epidemiology of Fluorine and Dental Health*

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TODAY, fluoridation of public water supplies for the partial control of dental caries is an accepted public health procedure. This is largely the direct result of the discovery of the quantitative relationship between fluoride domestic waters and the prevalence of dental caries in the population using such water during their lifetime.[1] The fortunate circumstance that fluoride is a natural constituent of many drinking waters furnished an opportunity to determine the fluoride concentration which is optimal for dental health, but is not associated with other conditions which might be objectionable.

In the United States as of September 15, 1952, nearly 8,500,000 residents of 427 communities are using domestic water supplies which are fluoridated.[2] These 427 communities are served by 288 separate water supplies and are distributed among 42 states and the District of Columbia. Furthermore, over 15,000,000 people are residing in 299 additional communities where this preventive measure has been approved and where plans are under way to start the program. Increasing interest in fluoridation is being reported also from other countries.‡

In a period such as this in the history of a new public health measure, when it is passing from the basic research stages of development to widespread public application, it may be of interest to pause briefly and reflect upon how the relationship of fluorides to dental caries came to light. In this finding, epidemiological studies were utilized to the fullest at every step.

EPIDEMIOLOGY AS A HETEROGENEOUS DISCIPLINE

The scope of epidemiology is widening as the scientific value of its methodology is recognized. From its earlier and precise etymological connotation—the study of epidemics—the technics of this method of investigation have very

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* Presented before a Joint Session of the American School Health Association, the Conference for Health Council Work and the Dental Health, Public Health Education, and Public Health Nursing Sections of the American Public Health Association at the Eightieth Annual Meeting in Cleveland, Ohio, October 23, 1952.

† Now, Dental Director (Retired) USPHS.

‡ Since presenting this paper the number of persons using fluoridated water supplies has considerably increased. According to information[3] as of May 1, 1953, there were 14,300,000 residents of 769 communities served by 407 separate water supplies using domestic water supplies which are fluoridated. In addition, there are 15,800,000 people served by 353 water supplies where the procedure has been approved but actual fluoridation has not as yet begun.

properly been applied to the study of infectious diseases of known etiology but of long duration such as tuberculosis, to diseases or conditions of unknown etiology such as cancer, cardiovascular disorders, and dental caries, to deficiency diseases of which pellegra, beriberi, or scurvy may serve as examples, to endemic conditions related to trace elements such as dental fluorosis or endemic goiter, to industrial hygiene, mental hygiene, and recently, to crash injuries. The method of study is essentially quantitative and the disease or condition being investigated may have a known, suspected, assumed, or unknown etiology.

In these days of specialization many scientific disciplines are becoming more and more centripetal. In a comprehensive scientific study of a new problem, on the other hand, epidemiology becomes more and more centrifugal, generally expanding into the realm of medical ecology. As the inquiry develops it crosses the boundaries of many disciplines in an attempt to utilize or synthesize existing knowledge pertinent to an explanation or interpretation of the phenomenon being studied. Epidemiology must of necessity utilize varying areas of the highly specialized disciplines in the hope of securing particular knowledge essential to explain a particular facet important to the disease or condition under investigation.

To me the study of the relation of fluoride containing domestic waters to dental health illustrates this point. Starting as an epidemiological inquiry of a dental disease, this study expanded into many areas hitherto thought far removed from any relation to dental hygiene. Many times, findings, long buried in the literature and apparently unrelated to oral disease were found on close study to be of unrealized value, taken either by themselves or when compared with other data by synthesization, and to have direct and important application to the investigation at hand.

Among the disciplines or specialized fields besides epidemiology, which were either essential to the development of the fluoride-dental health relationship or profitably utilized for an intelligible though still not complete biological explanation of this phenomenon, may be included basic research in analytical water chemistry, physiology and biochemistry, biometry, pharmacology, histology and pathology, bacteriology, dentistry, medicine, public health, sanitary engineering, and water works operation. To a somewhat lesser extent but none the less important in the earlier days was recourse to literature and to scientists in the fields of geology, hydrology, climatology, and veterinary medicine. Some of the earliest use of radioactive isotopes in the dental field were concerned with fluorine; today, in addition to physical chemistry, additional studies in biophysical aspects of this problem include electron microscopy and electron diffraction.

ON OUTLINING SEQUENTIAL STEPS

About 10 years ago Gibson [3] in his address as retiring president of the Philosophical Society of Washington used an illustration that seemed particularly applicable to some of our present-day epidemiological literature. Although the address dealt with the physical chemistry of solution, the metaphor fits a current trend so well that I am taking the liberty of quoting excerpts from this address.

In that portion of his paper entitled "The Historical Approach to Complicated Problems" he states:

> In the first verse of the fifty-first chapter of the Book of Isaiah, you will find the words "Hearken to me, ye that follow after righteousness, ye that seek the Lord; look unto the rock whence ye are hewn, and the hole of the pit whence ye are digged." . . .
>
> . . . this exhortation of Isaiah bids us make or renew the acquaintance of our intellectual ancestry, to seek an understanding of things

as they are from a deeper knowledge of how they came to be so, . . .

The broadened outlook on scientific problems comes to many more easily through a background of historical knowledge, through looking into "the pit whence we are digged." . . . In the first place, even a moderate familiarity with the historical development of our own or cognate fields enables us to put ourselves into the frame of mind of the masters who made the great advances in the past. If we take the trouble to understand their background, the problems as they saw them, the ideas available to them and the sources of these ideas, we can trace their steps through the arguments leading to important conclusions and try to emulate them. Glimpses of the turning points where they hesitated and the reasons that led them to prefer one road to the others are probably more valuable to the research student than the great discoveries themselves that now form an integral part of recorded science.

An unnecessary source of difficulty in the theoretical phases of science is the natural and, in some ways, laudable passion for elegance on the part of some thinkers. In constructing their theories these men start from current ideas, explore and reject many possibilities, and frequently achieve success by an inspired guess which is justified *a posteriori* by rigorous means. When their theory is finished, they proceed to polish it, to obliterate the traces of fumbling, to revise and refine the basic ideas and, in short, they end by presenting a picture that is most satisfying to one who is already familiar with the result but that is baffling to the unsophisticated. The nugget of truth is so carefully polished that all traces of the pit are removed. One cannot condemn this desire, but one can deplore the loss of those revealing intermediate steps that might have meant so much to the neophyte. . . .

This omission of the descriptive detail in each successive step followed during the accumulation of evidence for the support or refutation of a particular hypothesis is discernible in present-day epidemiological literature. We still wander hither and thither, expend energy in fruitless pursuits, and go the right when we should go to the left. Then, if happily we stumble on a correct answer or what seems to us to be a correct answer, we proceed to ignore "the pit from whence it was digged" and present a short polished objective report replete with graphs and tables which so often takes on the likeness of "the glorified abstract," of which we were so accurately forewarned by Mansfield Clark [4] nearly 20 years ago.

The student who may be interested in what thought processes directed the investigator to a particular approach, how many false starts were made, how long was a false scent pursued before it was dropped, and what particular conditions or circumstances influenced the change is left uninformed. In the interest of brevity and objectivity the "pit" is polished out *—and the nineteenth century studies of Budd, Snow, and Panum must of necessity be reprinted if the neophyte is to learn how a field epidemiologist thinks in the field. Like the student of military tactics the student of epidemiology needs the full set of operation orders for a complete understanding and accurate interpretation of how the objective was attained.

An excellent example in the twentieth century of descriptive epidemiology is the classical study of McKay,[5] published in 1916. This study thoroughly demonstrated that the unknown causative factor of mottled enamel was present in the water supply used during the susceptible period, i.e., the period of tooth calcification. Starting with an examination of the children of Colorado Springs, Colo., in 1909, McKay extended his studies to include the Pike's Peak watershed, the Arkansas River valley of Colorado, and the coal mining district north of Denver. Finally, he included persons of different ethnic stock, the Indians of southern Arizona. Not until he examined 6,873 individuals

* Responsibility for the current trend toward condensed publications does not lie entirely with the investigators themselves. It is rather a product of many factors not the least of which is the great increase in the number of papers being submitted for publication and the consequent stringent editorial policy for brevity. Furthermore, many readers now overtaxed in trying to keep abreast of an extensive and growing literature seem to prefer the more abbreviated publications.

of 26 communities or rural districts did he prepare his first series of papers, published in 1916. The conclusions he drew at that time have since been confirmed in innumerable studies in all the continents of the world. Irrespective of the place or peoples studied, no exceptions to McKay's findings of 1916 have been noted. He takes his reader into many localities, always stating why he went, recording his failures as well as his successes. As he carefully builds up a pattern of evidence—much of which at times is contradictory—he takes time to counsel the impatient in such human terms as:

> Lest the reader is tempted at this point to jump at a conclusion, I would counsel that judgment be suspended until other data, to be brought out later in the paper, has appeared.

Imagine what a scientific editor of today would do with a parenthetical remark like that!

McKay's series of papers closes on a suggestion of particular import. In consultation with Professor Strieby of Colorado College he concludes that standard water analyses are useless to explain this condition and calls attention to the trace elements in water and the need for the application of more elaborate technics necessary to determine their presence. Fifteen years, however, were to elapse before three independent investigators showed that the causative factor was trace amounts of fluoride in the domestic water supply. If I may paraphrase Frost [6] in his introduction to *Snow on Cholera,* the 1916 series of papers by McKay can well be read once as a story of exploration, many times as a lesson in epidemiology.

THE FIELD SURVEY AND THE FIELD REVIEW

In a recent review of twentieth century epidemiology from 1920, Gordon [7] differentiated between the field survey and the field review. He defines the former as a cross-section study of a population to determine the prevalence of a disease at a specified time, the field review as the logical progression of the field study into a long-term inquiry of incidence rather than prevalence.

The fluorine-dental caries relationship furnishes an illustrative example of both. The study of the 21 cities [1] in which the prevalence of dental caries in 12- to 14-year-old white children, who were continuous users of domestic water supplies of different fluoride concentration, may be cited as an example of the field survey. Differences in prevalence of as much as four to one were observed in different population groups and the optimal level of fluoride concentration was established at one part per million of fluoride (F).

The next step — subjecting the fluorine-dental caries hypothesis to experimental verification—became a field review. Beginning in 1944–1945 three independent studies were inaugurated in Grand Rapids, Mich., Newburgh, N. Y., and Brantford, Ont. After the establishment of prefluoridation dental caries prevalence rates in each city, fluoridation began early in 1945.

Thereafter, annual dental examinations were, and are being, made of thousands of children in each of these cities. The continuing reduced prevalence and decreasing incidence are illustrative of a type of field review where the decreasing prevalence and incidence of a disease entity is being measured quantitatively each year.

THE FUTURE OF FLUORIDATION

One should not arbitrarily dismiss the objections to fluoridation by merely saying that they are implausible. The true scientist is always conscious of the possibility of error and later proof that some assumption was incorrect. Considering the complexity of the medical field and its lesser basic knowledge in comparison with the precise knowledge

which has been accumulated already in the field of physics and chemistry, we certainly should welcome criticism as a stimulation for further research. It is encouraging that research as related to fluorine and dental health is not only continuing but greatly expanding.

It is an inexorable correlary to the introduction of a new public health measure that there should be some groups in opposition. In this respect, fluoridation of public water supplies has been no exception. Were Jenner's findings as to the value of cowpox virus in preventing smallpox promptly and avidly embraced by the medical profession and the general public? For the answer, dust off your Greenwood's *Epidemics and Crowd Diseases* [8] and read the two chapters entitled "Edward Jenner and Charles Creighton" and the "The Post Jennerian Controversy."

The list of public health control measures opposed in their beginning could be extended almost indefinitely and the examples would not all stem from the remote past. Within the memory of many of us is the controversy engendered by chlorination and coagulation in the treatment of public water supplies. Yet, no one today questions the desirability and need for purifying our drinking water.

In the face of opposition there is something to be said for adopting the philosophical approach and reviewing the history of preventive medicine. This not only benefits one's blood pressure; it also encourages the broad perspective and supplies insight which only a knowledge of the past can provide. Truth revealed through science has been challenged and stubbornly resisted again and again throughout history. If it were otherwise it would be deleterious to the advancement of scientific knowledge, for without opposition the scientist might well lull himself into a complacency that the millenium had arrived and that an undreamed of reasonableness, through some mysterious mutation, had found permanent asylum in the genes of man.

To get more specific, however, the weight of scientific evidence is far overbalanced in the direction of the proponents of fluoridation.[9] There is no longer any question that with an appropriate level of fluoride in the drinking water, dental caries can be controlled. Because of this they feel justified in recommending that communities which desire to avail themselves of the beneficial effects of fluoridation should be allowed to do so immediately. A scientist can only base his opinion on known available observed facts and these are that there are no known untoward effects developing in the millions of persons using water naturally containing fluoride at about 1.0 parts per million (F). Such evidence cannot be ignored, nor can the fact be disregarded that all the studies thus far conducted to explore these specific points have supported the safety of fluoridation.

Under no circumstances do we wish to imply that further research is unnecessary. On the contrary we feel that it should be encouraged by every possible means. Research on cholera did not end when Snow removed the pump handle. It is still highly important to us to discover the mode by which fluorides exert their protective influence. In doing so we may improve fluoride's effectiveness.

In closing it is needless for me to state that research is a dynamic activity. A public health problem can never be considered closed while the light of reason is free to contemplate the intricacies of the response of a mass population to a changed physiological environment.

REFERENCES

1. Dean, H. T., Jay, P., Arnold, F. A., Jr., and Elvove, E. Domestic Water and Dental Caries, II. A study of 2,832 white children, Age 12–14 years of 8 suburban Chicago communities, including *Lactobacillus Acidophilus* studies of 1,761 children. *Pub. Health Rep.* 56:761–792 (Apr. 11), 1941.

Dean, H. T., Arnold, F. A., Jr., and Elvove, E. Domestic Water and Dental Caries. V. Additional studies of the relation of fluoride domestic waters to dental caries experience in 4,425 white children, aged 12 to 14 years, of 13 cities in 4 states. *Pub. Health Rep.* 57:1155–1179 (Aug. 7), 1942.
2. Hagan, T. L. Personal communication recording data from the Division of Dental Public Health, BSS, USPHS, (Sept. 15), 1952.
3. Gibson, R. E. Physical Chemistry. Physical Reflections in a Chemical Mirror. *J. Washington Acad. Sci.* 31:325–348 (Aug. 15), 1941.
4. Clark, W. M. Evolution Toward a Mature Scientific Literature. *J. Bact.* 27:1–18 (Jan.), 1934.
5. McKay, F. S. (In collaboration with Black, G. V.) An Investigation of Mottled Teeth. *Dental Cosmos* 58:477–484 (May); 627–644 (June); 781–792 (July); 894–904 (Aug.), 1916.
6. Frost, W. H. Introduction to: *Snow on Cholera.* New York: Commonwealth Fund, 1936.
7. Gordon, J. E. IV The Twentieth Century—Yesterday, Today and Tomorrow (1920–) in, *The History of American Epidemiology.* St. Louis: Mosby, 1952.
8. Greenwood, M. *Epidemics and Crowd Diseases, an Introduction to the Study of Epidemiology.* New York: Macmillan, 1935.
9. Report of the *ad hoc* Committee on Fluoridation of Water Supplies. Division of Medical Sciences, National Research Council, Washington, D. C., 1952.

National Health Council Continues

At a special meeting on May 12, the delegate body, made up of 115 representatives of 44 member agencies, voted to continue the program activities of the National Health Council. This followed an earlier recommendation in March by the Board of Directors for an "orderly termination" of the program by December 31, 1953, due to lack of operating funds.

In arriving at this decision delegates expressed the opinion that the council has so useful and important a function to perform in the pooling of national health interests that it must be continued. The delegate body thus instructed the executive committee to "study, explore, and develop a service program in keeping with dependable revenues." Particular emphasis was given to continuing the work of developing community health services through local health councils and other means and an annual conference on pertinent national health needs and problems.

The new chairman of the Executive Committee is James E. Perkins, M.D., managing director of the National Tuberculosis Association. He said: "Membership in the Council has more than doubled in the past five years. That fact alone is vigorous proof of a growing need felt by the various groups working in the health field for some means to better understanding of over-all problems, more effective cooperation, and truer focus and balance of our efforts. . . . Further, the recent growth of member organization support for Council activity is actually a spectacular success story. From $16,000 five years ago, voluntary contributions from member agencies have grown steadily until they totaled over $100,000 in 1952."

Dr. Perkins was empowered to appoint a committee to bring in recommendations for the council's future to the next regular meeting of the Board of Directors on June 19. Following are the members of this committee:

Reginald M. Atwater, M.D.
Leona Baumgartner, M.D.
T. Duckett Jones, M.D.
Hugh R. Leavell, M.D.
Philip Mather
James E. Perkins, M.D. (*Ex officio*)
Mefford Runyon
Hart Van Riper, M.D.

In the homes she visits, the public health nurse inescapably becomes an interpreter of public health practices—even in such engineering matters as water fluoridation. Since she cannot avoid influencing people, either for or against program acceptance, it is well for her to go about her round of duties prepared for her interpreter's role.

The Role of the Public Health Nurse in the Community Water Fluoridation Program*

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PROGRESS in the field of public health increases the responsibilities of the public health nurse as a member of the health agency team. Working under direct supervision of the health officer, and as an adjunct to the specialists on the staff, the public health nurse assists in the furthering of public health measures designed to prevent and reduce illness and to produce positive health.[1] She carries the message to the components who make up the community, the individual and the family. Her contribution to the development of any public health program is unique because she is the one who gives direct service. It is she who works with the people, enters most into their daily lives, gains their confidence and interprets the program of a health department. Her contact is a continuing one. Professor C.-E. A. Winslow expresses this concept in the following quotation:

> The nurse is the spearhead of the public health campaign, its vital contact with the individual family in the home. Basic discoveries are made in some laboratory—in New York, Paris or London. These discoveries are translated into effective practical techniques by testing an experiment and development of administrative routines in Washington and the State Capitol. The city or county board of health makes them available on a local scale. But it is the public health nurse—in the city tenement or in the remote farm house —who makes contact with Mother and Father and Jennie and John. She is the ultimate channel through which the brilliant and beneficent discoveries of science are actually made available to the people in the home.[2]

The community water fluoridation program is now recognized as an important part of the generalized field of public health. Through her teaching and education of the individual, family, and community the public health nurse plays her most important role in this program. The nurse must be equipped not only with her nursing skill, but with knowledge of scientific information relating to disease control and health promotion. If the agency by which she is employed has accepted the water fluoridation program as a part of their responsibility, then the nurse must understand the technics of water fluoridation, the need for the program in the community, the cost of the program, its practical aspects, effectiveness and

* Presented before a Joint Session of the American School Health Association, the Conference for Health Council Work, and the Dental Health, Public Health Education, and Public Health Nursing Sections of the American Public Health Association at the Eightieth Annual Meeting in Cleveland, Ohio, October 23, 1952.

methods of control. In order that such a program may prove effective, it seems imperative that a coordinated educational program administered by a health department be implemented in an endeavor to thoroughly acquaint the community with its objectives. The public health nurse emerges as a valuable tool in this process. It should be pointed out that the public health nurse needs to maintain an objective viewpoint in regard to any program such as water fluoridation regardless of her own personal sentiments and beliefs.

The public health nurse has worked closely with the health officer in the communicable disease program, with the public health engineer in providing safe food, milk, and water supplies, with the nutritionist in the teaching of well balanced meals, with the health educator in the organization of community health programs, and with the dentist or dental hygienist in the health programs in schools and industry. Dental health has always been a part of generalized public health nursing. The addition of the water fluoridation program to public health dentistry merely necessitates equipping each nurse with knowledge of the relationship of fluorides to dental caries. How does she actually implement this program in her service day by day? As an example to illustrate how the nurse is confronted with this problem I shall relate the experience of one of the public health nurses in our agency.

A mother with her infant and three and one-half-year old preschooler, attended a child health consultation in the city. In her discussion with the public health nurse regarding the doctor's recommendation that the child be referred to the private dentist for care, she questioned the fact that the city has not had sodium fluoride added to the water supply. She had read that other communities were pursuing this policy. She was very indignant that her child was being deprived of the protection against tooth decay that publicity had led her to believe was available.

This clearly points up how important it is for the nurse to be equipped with skilled teaching ability and knowledge of the water fluoridation program to satisfy this mother's present concern without endangering any future community participation in this program.

The nurse's work in the child health consultations, in her contacts with school personnel, and in her daily visits to individuals and families provides excellent opportunities for teaching dental health. She emphasizes the importance of good nutrition, cleanliness, and supervision by a dentist and interprets recent developments in the field of dental research. The nurse cooperates with other professions in organizing community health programs and participates in many educational programs for lay groups and professional workers.

In conclusion it is important to emphasize that although the public health nurse does not actually use nursing skills in this program, one cannot minimize her major role in the community fluoridation water program through her education of individual, family, and community.

REFERENCES

1. *Manual of Public Health Nursing*. New York: National Organization for Public Health Nursing, 1939.
2. Wensley, Edith. *The Community and Public Health Nursing*. New York: Macmillan, 1930, p. 20.

Needed now is a laboratory test that will surely differentiate histoplasmosis from other mycotic infections. Evidently this is not a simple matter. This paper describes two antigenic components of the cultured organism which, if employed as complementary tests, may furnish the means for a differential diagnosis. More research is planned.

Antigenic Fractions of *Histoplasma Capsulatum* *

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THE greater cognizance of systemic mycotic infection has resulted in an increased demand for the serologic procedures which have been applied with some success in the study of coccidioidomycosis, histoplasmosis, and blastomycosis. Due to the use of crude antigens which contain components common to *Coccidioides immitis, Histoplasma capsulatum, Blastomyces dermatitidis,* and perhaps other mycotic species as well, the results have sometimes been confusing and even misleading. Histoplasma antigens, especially, give markedly positive reactions in certain sera from patients with coccidioidomycosis and blastomycosis.[1-3] Since such antigens are used widely in the differentiation of early pneumonitic infections, the problem of cross-reactivity is of particular importance to the internist whose patients have resided in endemic areas for coccidioidomycosis, histoplasmosis, and blastomycosis within a recent period of time (i.e., military personnel).

Studies designed to characterize the antigenic structure of *H. capsulatum* have, therefore, been undertaken. The present report describes the preparation and complement-fixation (CF) reactivity of two antigens derived from this organism. Since neither antigenic fraction is without limitations, these will also be discussed.

MATERIALS AND METHODS

1. *Preparation of Crude Mycelial and Yeast Phase Antigens of H. capsulatum*

a. *Mycelial antigen*—A culture filtrate of the mycelial phase of *H. capsulatum* (strain unknown) grown on Emmons' medium [4] was used as the crude mycelial antigen (histoplasmin).† In this instance, the cultures were incubated for approximately 10 weeks before they were filtered and processed for use.[5]

b. *Yeast phase antigen—H. capsulatum* (strain G-8) organisms were grown in the yeast phase on brain heart infusion agar at 37° C. for 72 hours. The growth from 2,400 ml. of culture medium was suspended in normal salt solution containing 1 per cent formalin and, after 48 hours, washed twice in a veronal-bicarbonate buffered solution of NaCl (0.85 per cent). The pH of this veronal buffered solution (VBS) was 7.3–7.4. After disintegration of the packed cells in a ball mill, the mass was resuspended in 100 ml. VBS, mixed for three hours for thorough extraction

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† Lot H-15, supplied by Parke, Davis and Company.

and centrifuged at 4,000 rpm for one hour. Following centrifugalization at 10,000 rpm for an additional hour, the supernate comprised the crude yeast phase extract (YP).

2. *Fractional Precipitation*

To 100 ml. of each of the crude antigens, dehydrated ethanol was added slowly and with rapid mixing to final concentrations of 0.1, 0.2, 0.3, 0.4, and 0.5 mole fraction. After the addition of each aliquot of alcohol, the alcohol-antigen mixture was agitated for 24 hours before the precipitate was removed by centrifugalization. The successive precipitates were each suspended in 25 ml. VBS, centrifuged to remove insoluble substances and stored at —20° C. With histoplasmin, however, visible precipitates were not formed prior to the 0.3 mole fraction. All processing was carried out at 4–6° C.

3. *Titration of Antigens*

Each of the mole fractions was titrated for antigenic activity by the CF technic. The 50 per cent end-point method used was that of Kent and Rein [6] and was described in an earlier report.[7] That dilution of antigen which gave the highest titer with sera from proved cases of histoplasmosis and which was neither anticomplementary nor hemolytic was considered optimum for use, and was used in all subsequent tests. Such dilutions did not react with normal sera.

RESULTS

In titrating the mole fractions for optimal activity, each antigen was diluted by twofold increments from 1:2 to 1:1,024 and tested with two sera which reacted to a CF titer of 1:64 with crude YP antigen. The five mole fractions (0.1, 0.2, 0.3, 0.4, and 0.5) which were derived from the YP extract were sharply divided into two distinct patterns of reactivity. The reactions of the three fractions (0.3, 0.4, and 0.5) precipitable from histoplasmin were essentially alike and were similar to those of the crude filtrate. Since the 0.1 and 0.2 mole fractions were representative of one pattern and the 0.3, 0.4, and 0.5 mole fractions of both histoplasmin and YP extract illustrative of the other, only those reactions which were obtained with optimum dilutions of the 0.1 and 0.4 mole fractions are shown in Table 1. Reactions with crude histoplasmin were substituted for those of the 0.1 and 0.2 mole fractions which were not yielded by this antigen. As shown in the table, the 0.1 mole fraction of the YP antigen was the only one which continued to react with both sera, while the 0.4 mole fractions of histoplasmin and crude YP extract, as well as histoplasmin, failed to react with serum 1. The significance of these findings became apparent only when it was observed that serum 1 was from an early case of histoplasmosis taken about the *sixth week* after onset, and that serum 2 was a specimen submitted during the *twelfth month* of a more severe infection.

Such diverse reactions indicated that there were at least two antigen-antibody systems involved in the serologic study of histoplasmosis. Histoplasmin reacted only with serum 2 because it was comprised largely of the 0.4 mole fraction which detected an antibody that appeared only in later infections. Since it contained little, if any, of the 0.1 mole fraction which detected an antibody formed early in the course of illness, it was incapable of reaction with serum 1. It is interesting to note that had histoplasmin been titrated with serum 1 alone, it would have been considered unsuitable for use in the CF test. On the other hand, since the crude YP extract contained both components, it reacted with serum from the early as well as the later case. However, the optimum dilution of 1:64 with the 0.1 mole fraction as compared with that of 1:8 for the 0.4 mole substance suggested that the 0.4 mole fraction was the com-

TABLE 1

Reactions with Optimal Dilutions of Antigens of H. capsulatum and Sera from Two Proved Cases of Histoplasmosis

Antigen	Optimum Dilution	Serum No. 1 (early) U.* 1:4	1:8	1:16	1:32	1:64	1:128	Serum No. 2 (late) U.* 1:4	1:8	1:16	1:32	1:64	1:128	Antigen
0.1 Fraction (YP)	1:64	+	+	+	+	+	−	+	+	+	−	−	−	−
0.4 Fraction (YP)	1:8	−	−	−	−	−	−	+	+	+	+	+	−	−
Crude Histoplasmin	1:4	−	−	−	−	−	−	+	+	+	+	+	−	−
0.4 Fraction Histoplasmin	1:64	−	−	−	−	−	−	+	+	+	+	+	−	−
VBS †		−	−	−	−	−	−	−	−	−	−	−	−	

* U—Undiluted
† VBS—Veronal buffered solution

ponent of lesser concentration in the YP antigen. Thus, the quantity of the 0.1 and 0.4 mole fractions appeared to be inversely proportional in the crude antigens in current use.

These findings offer a partial explanation for the differences in reactions which have occurred with the routine use of histoplasmin and crude YP antigens. They, furthermore, provide a clew as to why crude YP extracts appear to be superior for the detection of early cases, while histoplasmin has been more satisfactory in the study of older, more generalized infections.

Since the 0.1 and 0.4 mole fractions of the YP antigen were representative of the two types of reactivity noted, further comparisons were made with serial serum specimens from four other proved cases of histoplasmosis. The CF titers illustrated in Table 2 corroborate the finding that *H. capsulatum* developed an antibody configuration in later infections which was not detectable by the 0.4 mole YP fraction during an earlier phase of the disease. As shown in cases 1 and 3, the antibodies demonstrated by this antigen in the CF test did not appear until after the eighth week of infection. In case 2, the titer with the 0.4 mole antigen increased from 1:16 to 1:64 during the twelfth and twenty-fourth weeks, and in case 4 (the infection of longest duration) the CF level was elevated to 1:128. Reactions with the 0.1 mole fraction roughly paralleled those of the crude YP antigen, especially with the early specimens.

In order to gain further insight into the complex antigenic mosaic of this organism, the various antigens used in this study were titrated simultaneously with serial serum specimens from three additional persons with proved histo-

TABLE 2

Comparison of CF Titers Obtained with Three Antigens of Yeast Phase H. capsulatum in Four Cases of Histoplasmosis

Case No.	Time After Onset Weeks	Serum Titer: Crude Extract YP Antigen	0.1 Mole Fraction	0.4 Mole Fraction
1	6	1:64	1:32	..
	8	1:64	1:32	..
	10	1:64	1:16	1:4
2	12	1:64	1:32	1:16
	24	1:64	1:32	1:64
3	8	1:8	..	..
	12	1:64	1:32	1:8
4	32	1:128	1:8	1:128

TABLE 3

Comparison of CF Spectra with Five Histoplasma Antigens in Sera from Proved Cases of Histoplasmosis

Case No.	Month of Disease	Histoplasmin	0.4 Mole Fraction Histoplasmin	Crude YP Extract	0.1 Mole of YP Extract	0.4 Mole of YP Extract	Remarks
1	2	..	..	1:16	1:64	..	Primary, pulmonary histoplasmosis
	3	..	..	1:8	1:16	1:8	Hospitalized 2½ months
	4	..	1:2	1:4	1:8	1:4	Returned to duty in 5th month
	5	..	1:4	1:4	1:8	1:2	
2	10	1:128	1:128	1:16	1:32	1:32	Severe, generalized histoplasmosis
	12	1:128	1:128	1:16	1:32	1:64	
	16	1:64	1:64	1:8	1:16	1:16	Uncomplicated
	20	1:16	1:32	1:4	1:8	1:16	Clinical improvement beginning with 13th month
3	18	1:16	1:16	..	..	..	Fatal disease.
	20	1:32	1:64	..	..	..	Generalized histoplasmosis and Hodgkins disease

plasmosis. Again, as illustrated in Table 3, the higher titers with crude and 0.1 mole YP antigens occurred in sera taken during an earlier phase of disease. The CF spectra of both 0.4 mole fractions were essentially alike in two of the cases, thus simulating the reactions obtained with histoplasmin. In case 1, which was a primary, pulmonary infection of moderate severity, titers with the 0.4 mole fractions were either negligible or absent. On the other hand, both 0.4 mole fractions reacted with sera from case 2, an older, more generalized infection. The only instance in which the 0.4 mole fraction derived from YP extract failed to react similarly to the 0.4 mole fraction made from histoplasmin occurred with sera in case 4. This case, one of generalized histoplasmosis and Hodgkin's disease, had a fatal termination. The sera submitted two months and two weeks, respectively, prior to death fixed complement with the antigens of histoplasmin but not with the antigens of the crude YP extract. These latter reactions confirmed findings previously reported from this laboratory that yeast phase antigens do not detect antibody in cases where severe generalized histoplasmosis is complicated with endocrinopathy.[2, 3] They also indicated that the 0.4 mole fractions of histoplasmin and the crude YP extract might not be antigenically identical.

The specificity of the fractions was then tested using sera from cases of blastomycosis and coccidioidomycosis. The results are summarized in Table 4. Crude histoplasmin, crude YP antigen, and the 0.1 mole fraction of the latter reacted with sera from cutaneous and generalized blastomycosis and primary coccidioidomycosis. The 0.4 mole fractions of both crude antigens were negative in all sera tested, indicating that these fractions were specific in their reaction with an antibody developed only by *H. capsulatum*.

DISCUSSION

From the foregoing data, it is apparent that *H. capsulatum* contains at least two distinctly different antigenic components that are precipitable by ethanol. Both were produced by the yeast phase of the organism. The 0.1 mole fraction contained an abundance of a substance

TABLE 4

Comparison of CF Spectra with Five Histoplasma Antigens in Sera from Blastomycosis and Coccidioidomycosis

Case No.	Histoplasmin	0.4 Mole Histoplasmin	Crude YP Extract	0.1 Mole YP Extract	0.4 Mole YP Extract	Homologous CF Titer	Diagnosis
1	1:32	..	1:8	1:16	..	1:8	Primary coccidioidomycosis
2	1:8	..	..	1:4	..	..	Primary coccidioidomycosis
2	..	..	..	..	..	1:8	Primary coccidioidomycosis (1 month later)
3	1:4	..	..	..	..	1:256	Disseminated coccidioidomycosis
4	1:8	..	1:4	1:4	..	1:8	Cutaneous blastomycosis
5	..	..	1:64	1:64	..	1:64	Generalized blastomycosis

which reacted with antibody formed early in the course of histoplasmosis. Unfortunately, this substance also contained component(s) which reacted with blastomycotic and coccidioidal sera as well. However, at a 0.4 molar concentration of ethanol, a second fraction was precipitated which, while it was not capable of detecting antibody early in the disease, reacted only with sera from later Histoplasma infections. The latter fraction was also yielded by histoplasmin.

By investigating the CF reactions of these ethanol fractions with sera from proved cases of histoplasmosis, the active and cross-reactive components of the two crude antigens were located and, to a limited extent, characterized. Histoplasmin, a singularly poor antigen for the detection of the CF antibody in early histoplasmosis, contained essentially none of the substance by which such antibody was detectable, but a relatively large quantity of the component which reacted only with sera from later infections. On the other hand, crude YP extract reacted with sera from early histoplasmosis because it contained a large quantity of a substance which reacted with sera from such infections, and relatively less of the component which was capable of detecting antibody developed only in later cases. Such findings indicate that the relating of antigen-antibody reactions to the time after onset of illness is a factor of primary importance in the assay of mycotic antigens. Furthermore, they make the standardizing of crude antigens for routine use a precarious task. For example, an optimum dilution of a crude YP antigen may reflect the optimal activity of only one of its two components and thereby contain an insufficient or an excess quantity of the other. Those titrated with sera from early infections will contain too little of the 0.4 mole fraction to detect this antibody in sera of older case. Conversely, those standardized with sera from more generalized cases may contain an excess of the 0.1 mole fraction and thereby fail to react optimally with the antibody developed in early infections. In fact, those titrated with later sera may show two rather widely separated dilutions at which they are optimally reactive, if the two types of antibody have been developed in the sera by which they are tested. Optimum dilutions with histoplasmin are less difficult to establish, since this antigen reacts only with sera from later cases.

While the factor of relating antigen-antibody reactions to the duration of disease has been of primary importance in "locating" the active and cross-reactive components of crude Histoplasma antigens, this relationship must be em-

phasized still further in evaluating the specificity of fractions derived therefrom. It must be ascertained, for example, that a component which reacts with antibody developed later in the course of *H. capsulatum* does not react with antibody developed earlier in an infection with another mycotic agent. Since this involves the testing of numerous sera from many different types and phases of the diseases produced by mycotic agents, it is obvious that the 0.4 mole fraction described in this report cannot be regarded as a substance which reacts only with an antibody produced by *H. capsulatum*. However, it is believed that the experimental data obtained in this investigation provide a basis for further and more definitive characterization of the antigenic mosaic of this organism.

CONCLUSIONS

It has been found that there are at least two antigenic components of *H. capsulatum* which are important to the serologic study of infections caused by this agent. Both were precipitable by ethanol. A 0.1 mole fraction, produced in greater quantity by the yeast phase of the organism, reacted with sera from early histoplasmosis but also cross-reacted with sera from early coccidioidomycosis and cutaneous blastomycosis infections. The 0.4 mole fraction was produced in greater quantity by the mycelial phase of the organism. This substance was incapable of detecting CF antibody in very early cases of histoplasmosis, but did not react with sera from cases of coccidioidomycosis and blastomycosis. However, too few sera have been tested for this component to be regarded as "specific."

REFERENCES

1. Salvin, S. B. Serologic Relationships of Fungus Antigens. *J. Lab. & Clin. Med.* 34:1096–1104, 1949.
2. Campbell, C. C., and Saslaw, S. Use of Yeast Phase Antigens in a Complement Fixation Test for Histoplasmosis III. Preliminary Results with Human Sera. *Pub. Health Rep.* 64:551–560, 1949.
3. Campbell, C. C., and Binkley, G. E. Serological Diagnosis of the Systemic Mycoses. (In Press.)
4. Emmons, C. W., Olson, B. J., and Eldridge, W. W. Studies of the Role of Fungi in Pulmonary Disease I. Cross Reactions of Histoplasmin. *Pub. Health Rep.* 60:1383–1394, 1945.
5. Hillegas, A. Personal communication.
6. Kent, J. F., and Rein, C. R. Serodiagnosis of Amebiasis. *Science* 103:598, 1946.
7. Saslaw, S., and Campbell, C. C. The Use of Yeast Phase Antigens in a Complement Fixation Test for Histoplasmosis I. Preliminary Results with Rabbit Sera. *J. Lab. & Clin. Med.* 33:811–818, 1948.

Industrial Health Unit Created

A Section on Occupational Health, the first to be created by a local health department in Kentucky, has been established by the Louisville-Jefferson County Health Department. A full-time industrial health nurse and sanitarian will assist plants in setting up industrial medical and first-aid programs, survey for occupational hazards, and analyze industrial materials that may be dangerous to workers. Of the 13,000 industrial establishments in the state, about 30 per cent are reported to be in the Louisville area.

A nice point is brought out in this paper. In a family study of recently reported tuberculosis patients among older men—compared with a comparable group of younger male cases—a revealing difference was shown in age of contacts and hence in terms of early primary infections with resulting partial immunization. The implications are not to be missed.

The Age Relationship of Cases of Pulmonary Tuberculosis and Their Associates*

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THE most significant recent trend in the epidemiology of tuberculosis is the degree to which the disease is affecting older people, particularly older men. In 1932, 37 per cent of the deaths from pulmonary tuberculosis in New York City occurred in individuals over 45 years of age, and 78 per cent of these deaths were accounted for by males. Only one-quarter of the newly reported cases of pulmonary tuberculosis developed in this age group, and less than one-fifth of all new cases were found in older men.

By 1950, less than 20 years later, the proportion of new cases and deaths from pulmonary tuberculosis occurring in persons over 45 had doubled. More than 65 per cent of the residents of New York City who died of the disease were over 45 years of age, and men were responsible for 85 per cent of these deaths. Similarly, almost half of the newly reported cases of pulmonary tuberculosis were now found in people over 45, and males in this age group contributed 36 per cent of all new cases.

During this same period a sharp decline in the incidence of tuberculous infection and its serious sequelae in childhood was noted. The percentage of children reacting to the tuberculin test fell rapidly and the mortality from all forms of tuberculosis in persons under 10 years of age reached an all-time low. A major factor in these reductions was undoubtedly the general decrease in the amount of tuberculous infection in the community. This can be attributed to the presence of fewer communicable cases of the disease, their more effective isolation, and the increased resistance of exposed individuals resulting from their improved standard of living. In addition, another possible explanation of the much sharper decline in tuberculous infection in childhood presents itself. Could there have been fewer children under 10 exposed to infection in the household in recent years because the source cases were older and less likely to have young children living with them?

To test this hypothesis a study of the households of cases of pulmonary tuberculosis first reported in 1950 was undertaken. Only male index cases were included, since it had been demonstrated

* Presented before the Epidemiological Section of the American Public Health Association at the Eightieth Annual Meeting in Cleveland, October 21, 1952.

TABLE 1

Age and Race Distribution of All Cases and Sample of Pulmonary Tuberculosis in Males over 25 Years of Age First Reported in New York City, 1950

Age of Case at Time of First Report	White			Nonwhite			Both Races Combined		
		Sample			Sample			Sample	
	No. of All Cases	No. of Cases	Per cent of All Cases	No. of All Cases	No. of Cases	Per cent of All Cases	No. of All Cases	No. of Cases	Per cent of All Cases
Group A	744	174	23.4	528	135	25.6	1,272	309	24.3
25–34 years	313	65	20.8	271	64	23.6	584	129	22.1
35–44 "	431	109	25.3	257	71	27.6	688	180	26.2
Group B	1,843	402	21.8	352	67	19.0	2,195	469	21.4
45–54 years	749	168	22.4	185	34	18.4	934	202	21.6
55–64 "	621	141	22.8	105	18	17.1	726	159	21.9
Over 65 "	473	93	19.7	62	15	24.4	535	108	20.2

TABLE 2

Distribution of Index Cases of Pulmonary Tuberculosis and Associates by Stage of Disease of Index Case at Time of Report—New York City, 1950

Stage of Disease of Index Case at Time of Report	Index Cases				Associates			
	Group A		Group B		Group A		Group B	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Minimal and Moderately Advanced	175	56.6	193	41.2	371	64.9	280	42.4
Far Advanced	122	39.5	264	56.3	181	31.6	370	56.1
Not Reported	12	3.9	12	2.5	20	3.5	10	1.5
Total	309	100.0	469	100.0	572	100.0	660	100.0

that the postponement of the age of peak morbidity and mortality from tuberculosis was due primarily to the shift toward the older ages in males. A sample of 778 cases was selected at random from the total of 3,467 men more than 25 years old with pulmonary tuberculosis reported for the first time in 1950. Both sample and total were divided into two broad age groups, those 25–45 years of age being designated as Group A, and those over 45 as Group B. Groups A and B were further subdivided by race and into 10-year age groups, those over 65 being combined into one class. As might be anticipated, the white males were considerably older than the nonwhite males, 70 per cent of the former and 33 per cent of the latter falling into the group over 45 years of age. Comparison of the sample and total population revealed no significant differences in regard to age and race distribution (Table 1).

The data were also analyzed in terms of stage of disease at the time of the first report. Fifty-seven per cent of the 309 patients in Group A had minimal or moderately advanced tuberculosis, and 40 per cent had far advanced tuberculosis. The proportion of cases with more and less advanced disease in Group B was almost the exact reverse. The distribution by stage of disease of sample and total population did not vary significantly. A further indication of the difference in the incidence of advanced tuberculosis in the two groups is provided by the percentage of associates exposed to massive infection. Less than 32 per cent of associates of patients in Group A, compared with 56 per cent of associates of cases in Group B, fell into this category (Table 2).

TABLE 3

Relationship of Associates to Index Cases of Pulmonary Tuberculosis—New York City, 1950

Relationship of Associates to Index Case	Male				Female				Both Sexes Combined			
	Group A		Group B		Group A		Group B		Group A		Group B	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Conjugal	..	..	..	..	120	32.5	167	41.1	120	21.0	167	25.3
Parent	17	8.4	..	..	33	8.9	7	1.7	50	8.7	7	1.1
Child	75	36.9	117	46.1	76	20.6	101	24.9	151	26.4	218	33.0
Sibling	30	14.8	11	4.3	44	11.9	25	6.2	74	12.9	36	5.5
Other	81	39.9	126	49.6	96	26.0	106	26.1	177	30.9	232	35.1
All Associates	203	100.0	254	100.0	369	99.9	406	100.0	572	99.9	660	100.0

TABLE 4

Distribution of Index Cases of Pulmonary Tuberculosis and Associates by Size of Household—New York City, 1950

No. of Associates in Household	Index Cases				Associates			
	Group A		Group B		Group A		Group B	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
0	107	34.6	212	45.2	..	..	..	..
1	56	18.1	99	21.1	56	9.8	99	15.0
2–3	93	30.1	91	19.4	236	41.3	220	33.3
4–13	53	17.2	67	14.3	280	48.9	341	51.7
Total	309	100.0	469	100.0	572	100.0	660	100.0

The distribution of the 1,232 recorded household associates by sex and relationship to the index case is shown in Table 3. Wives made up 21.0 per cent, children 26.4 per cent, parents 8.7 per cent, and siblings 12.9 per cent of the 572 associates of the younger cases of tuberculosis. The proportion of wives and children was somewhat higher, and of parents and siblings considerably lower, among the 660 associates of the older cases. In both instances approximately one-third of the household members were more distantly related, or not related, to the index cases. If allowance is made for the influence of wives, no striking differences in the sex distribution of associates are noted.

Another factor considered was the size of the households of the cases included in the sample. Over 45 per cent of the persons in Group B, compared with less than 35 per cent in Group A, had no recorded household associates. By contrast, the proportion of index cases with two or more associates was 13.6 per cent higher in Group A. Approximately the same percentage of men under and over 45 listed only one household contact, presumably a spouse. Similarly, more associates were found in the households of younger men with tuberculosis when the distribution was analyzed in terms of number of associates rather than number of index cases (Table 4). These differences were much less striking in the instance of households of nonwhite patients.

The remainder of the data in the study dealt with the topic of most direct concern, the ages of the associates of men with pulmonary tuberculosis newly reported in 1950. The 1,232 members of the households of the cases in the

TABLE 5

Age Distribution of Male Household Associates of Cases of Pulmonary Tuberculosis—New York City, 1950

Age of Associate in Years	Group A		Group B	
	No.	Per cent	No.	Per cent
Under 5	38	19.5	19	7.9
5–9	35	17.9	20	8.4
10–14	22	11.3	28	11.7
15–24	23	11.8	73	30.5
25–34	17	8.7	33	13.8
35–44	20	10.3	26	10.9
45–54	18	9.2	16	6.7
55–64	11	5.6	12	5.0
Over 65	11	5.6	12	5.0
Not Stated	8		15	
Total	203	99.9	254	99.9

sample consisted of 457 males and 775 females. The disproportion between the sexes was due to the inclusion of 287 wives, who made up 37 per cent of the female total. As might be expected, the wives of the men in Group A were predominantly in the 15- through 44-year-age group, whereas the spouses of the older men in Group B were almost all over 35, with a maximum concentration in the decade from 45 through 54. The large proportion of wives among female associates, and the differences in their age distribution in the two groups, made it advisable to compare the age composition of household associates exclusive of conjugal partners. This has been done and the results are shown in Tables 5–7.

Two hundred and three males were associates of cases in Group A, and 254 of cases in Group B. Almost half of those in Group A were under 15 years of age, and 37.4 per cent were less than 10 years old. Twenty eight per cent of the associates in Group B were below 15, and only 16.3 per cent under 10 years of age. By contrast, individuals 10–45 years old made up 42.1 per cent and 66.9 per cent of the associates in Groups A and B, respectively. The differences between the percentages of males under 10, and 10–45 years of age, in the households of cases in the two groups are of statistical significance. On the other hand, little variation was noted in the proportions of associates over 45 (Table 5).

A similar picture was presented by female household members when the wives of the index cases were excluded. Two hundred and forty-nine females in Group A, and 239 in Group B, remained. Females under 10 years of age made up 36.7 per cent of the associates in Group A, and only 16.1 per cent of the associates in Group B, and the difference between these figures is statistically significant. Conversely, 29.8 per cent of the female household members in Group A, and 45.9 per cent of those in Group B, were 10–35 years old, also a highly significant variation. The proportion of female associates over 35 was almost identical in the two groups (Table 6).

TABLE 6

Age Distribution of Female Household Associates (Conjugals Excluded) of Cases of Pulmonary Tuberculosis—New York City, 1950

Age of Associate in Years	Group A		Group B	
	No.	Per cent	No.	Per cent
Under 5	48	19.8	15	6.7
5–9	41	16.9	21	9.4
10–14	21	8.7	20	8.9
15–24	28	11.6	52	23.2
25–34	23	9.5	31	13.8
35–44	33	13.6	24	10.7
45–54	20	8.3	27	12.1
55–64	16	6.6	13	5.8
Over 65	12	5.0	21	9.4
Not Stated	7		15	
Total	249	100.0	239	100.0

Table 7 indicates the age distribution of male and female associates combined. As would be anticipated, the pattern was the same as for the sexes separately. A significantly higher percentage of all household members under 10 years of age was found in Group A, and between 10 and 35 in Group B. The proportion of associates over 35 years old

TABLE 7

Age Distribution of All Household Associates (Conjugals Excluded) of Cases of Pulmonary Tuberculosis—New York City, 1950

Age of Associate in Years	Group A		Group B	
	No.	Per cent	No.	Per cent
Under 5	86	19.7	34	7.3
5–9	76	17.4	41	8.9
10–14	43	9.8	48	10.4
15–24	51	11.7	125	27.0
25–34	40	9.2	64	13.8
35–44	53	12.1	50	10.8
45–54	38	8.7	43	9.3
55–64	27	6.2	25	5.4
Over 65	23	5.3	33	7.1
Not Stated	15		30	
Total	452	100.1	493	100.0

was essentially the same in the two groups.

DISCUSSION

The observations just presented illustrate some of the effects produced by the shift in tuberculosis morbidity to the older ages, particularly in men. As previously mentioned, the proportion of new cases reported in males over 45 has doubled in less than a generation, and now makes up 36 per cent of all new cases. Not only is pulmonary tuberculosis more frequent in older men, but it is also in a more advanced stage at the time of discovery. Fifty-six per cent of males over 45, compared with less than 40 per cent of men 25–45, newly reported as tuberculous in New York City in 1950, had far advanced disease at the time of report. The difference in the proportion of associates exposed to massive infection in the households of the two groups was even greater.

As a result of these differences the risk of tuberculous infection in certain segments of the population has been materially altered. The danger of contagion has become greater for the associates of older cases, and less for the associates of younger cases of tuberculosis. This applies particularly to the immediate households of tuberculous individuals. Study of such households show that they vary in several important respects. Parents and siblings make up a larger proportion of the associates of male cases, 25–45 years of age, than of the associates of older men with the disease. Children of all ages are somewhat more frequently present in the homes of patients over 45. On the other hand, if consideration is given to the size of the household, a different picture is presented. Almost half of the older men with tuberculosis are without household associates, and an additional 21 per cent list only one, presumably a spouse. By contrast, a smaller proportion of the younger cases have no, or only one, contact; while an additional 13.6 per cent have two or more contacts in the home. The sample studied contains an average of 1.9 household associates for each male case of tuberculosis under 45, and 1.4 household associates for each case over 45 years of age at time of report.

The aspect of the subject of greatest interest is the age of the associates in relationship to the age of the index case. Comparison of the households of the two groups of cases indicates a marked concentration of children in the homes of younger men with tuberculosis. When marital partners are excluded, over 37 per cent of the associates of the latter group are under 10 years of age, which is more than twice the proportion of children found among the associates of males over 45. Individuals between 10 and 35 form a significantly greater part of the households of older patients, primarily as a result of the large number of 15- to 25-year olds included among them. The same trends, with minor variations, characterize the age distribution of male and female household members considered separately.

The implications of these findings in the epidemiology of tuberculosis are far-reaching. There is general agreement that the level of tuberculous infection

in the community has become progressively lower during the past 20 years as a result of the reduction in the number of communicable cases present. A more rapid decrease in the extent of the tuberculosis problem in children has also been noted, but no adequate explanation for it has been advanced. This study would suggest that the relationship between the age of household associates and cases of tuberculosis may be the major factor responsible.

It has been demonstrated that a selective reduction in the opportunities for exposure of young children accompanies the aging of the tuberculous population. Its superimposition on the universal drop in infection could readily account for the phenomenal recent decline in the percentage of tuberculin reactors under 10 years of age. The same influence would also lead to a relatively increased risk from tuberculosis among adolescents and young adults. Having escaped contact with the tubercle bacillus in childhood, they would be more apt to encounter it for the first time between 10 and 35. The sharp rise in the incidence of new cases characteristic of this age group may well be a reflection of the greater morbidity which follows the resulting primary infections in adult life. There is reason to believe that the same elements will continue to operate for an indefinite period, and that the relationship between the age of associates and cases of tuberculosis will be a factor of growing importance in tuberculosis.

SUMMARY

1. The proportion of new cases and deaths from tuberculosis occurring in older individuals, particularly males, has increased rapidly in recent years.

2. The decline in the level of infection in childhood during this same period has been extremely sharp.

3. Study of representative samples of the households of cases of pulmonary tuberculosis in males 25–45 years of age, and over 45 years of age, reported in New York City in 1950, reveals characteristic variations in their composition.

4. Older individuals with tuberculosis have fewer household members, and associates less frequently under 10 years of age, than younger persons with the disease.

5. These differences may have been a major factor in the relatively greater reduction in tuberculous infection, morbidity, and mortality in childhood over the past 20 years.

6. The same factor may also contribute materially to the rapid rise in the incidence of tuberculosis which still occurs in adolescents and young adults.

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A country in which tuberculosis remains high among the causes of death offers a good opportunity to measure the public health value of large-scale immunization with BCG. Though the experiment is too new to be accurately evaluated, it seems to be producing benefits. There are other reasons for reading this paper and storing it away in one's memory.

Control of Tuberculosis in Chile, 1952*

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FOR years tuberculosis in Chile has been second among the causes of death; since 1950, it has come down to the fourth place. The three higher positions are occupied by bronchopulmonary diseases, diseases of infancy, and cardiovascular diseases, every one of which is a group and not a single cause. As a morbid entity, tuberculosis is still leading. From 1903, when national data began to be collected, mortality has been decreasing from 300.2 in that year to 220.0 in 1948 (Figure 1). The peak was 319.1 in 1906. In 1949 it diminished to 195.1 and in 1950 to 150. It is fairly safe to predict that the curve is really declining. The diminution is still more pronounced for the pulmonary forms. This can only be explained on the assumption that the diagnosis of the extrapulmonary localization was very defective in the past. Consequently, the decrease during the first half century was undoubtedly more pronounced than it appears.

The phenomenon which has occurred is a composite of the action of different trends throughout the country. Being narrow and very long, Chile has three different zones: (1) the northern one, mainly devoted to mining and where the climate is mild and dry; (2) the central and intermediate zone which is mostly engaged in agriculture and industry, and (3) a southern one, which is both rainy and rather cold and where people work in agriculture, lumbering, and sheep breeding. Mortality has been higher in the mining district and has come down sooner. In Concepción, it has risen lately. There the second steel mill in Latin America was recently established and the urbanization process has been comparatively phenomenal. Magallanes, the southernmost province, is a case by itself. Though the general mortality is by far the lowest in the country and the standard of living is considerably better than in the rest of the territory, Magallanes has a very high tuberculosis mortality. It was 561 in 1921 and rarely has it gone below 300. People come from the Archipelago of Chiloé, where they live in scattered and isolated places with very poor communications, to take part in the sheep shearing during the summer and may become infected as suddenly and seriously as did the Senegalese Negroes that the French took with them to the first world war.

As far as age distribution is concerned (Figure 2), the increase of tuberculosis among children below 10 years of age is probably artificial. In the past, many of the tuberculosis cases were registered as meningitis or as enteric infections. (Paratyphoid was the standard diagnosis in primary infections.) From 10 to 14 and from 15

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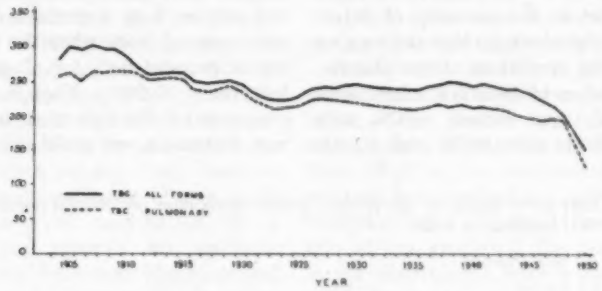
FIGURE 1—Tuberculosis death rate, deaths per 100,000 population. Three-year moving average, 1903–1951, Republic of Chile



to 19 the curve describes a parabola which is even more pronounced for the 20–24 and the 25–34 years of age groups. This last fact has been the principal factor for the change in the curve since 1948. The group of 65 and over was the one that diminished more rapidly until 1939 and is the only one which is now increasing. Up to 10 years of age there is no difference between the sexes. From then on the female death rate is higher and increases more than the male up to 20 years of age. From then on men begin to die in larger numbers and this curve crosses that of women in the 30 to 39-year group and continues ascending up to 60 years. It also may be stated that the lines tend to cross each other earlier in life. Out of 100 tuberculous deaths there were 47 men in 1917 and 52 in 1947.

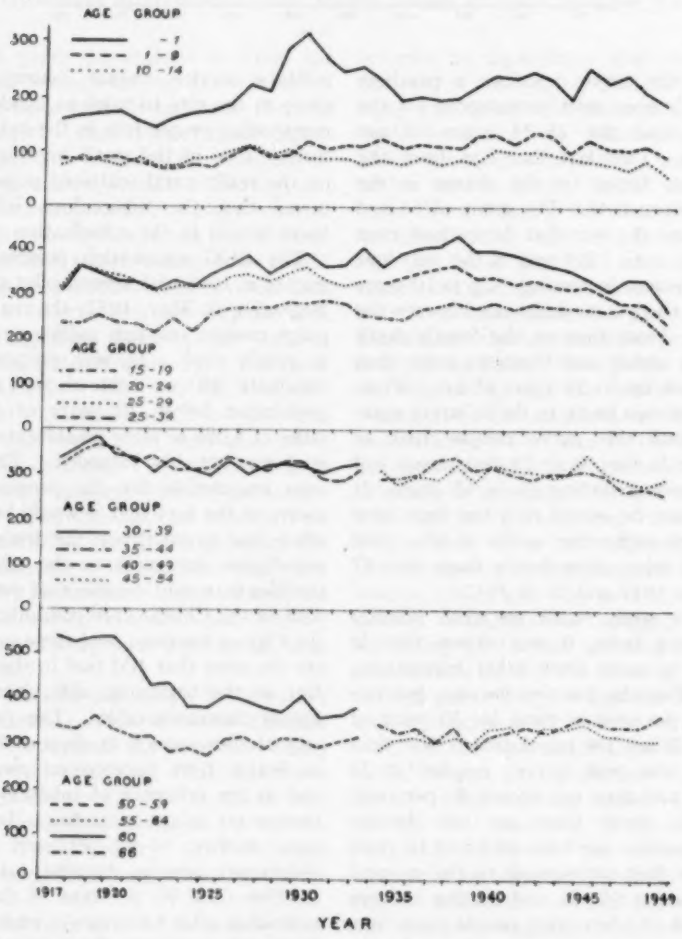
In a study based on some 500,000 Mantoux tests, it was shown that in cities of more than 5,000 inhabitants, the tuberculin reaction becomes positive in 85 per cent of them by 20 years of age. When the population is less than 5,000, the peak is only reached at 28 years and does not exceed 80 per cent. In the curve there are two definite divergences: one between 8 and 10 years of age that corresponds to the moment of entering schools, and another between 18 and 20 when many people come from the country and remote places for the military service, young country girls come to the city to work as maids, and many other people join in the industrial force. Two of the small investigations on the really rural scattered population reveal that the tuberculosis infection there is still in the colonization period.

The BCG vaccination program was started in 1948 with several pilot studies. Beginning in May, 1951, the real campaign covered one-half million people in a year's time. It was proposed to vaccinate 50 per cent of the anergic population below 20 years of age in cities of 5,000 or more inhabitants. This goal was actually exceeded. The persons responsible for the program are aware of the fact that it would be more efficacious to vaccinate the truly rural population, inasmuch as the migration to cities is so considerable that over one-fifth of the Chileans are concentrated in the City of Santiago, and these migrants are the ones that add fuel to the flame. But at the beginning, difficulties were almost insurmountable. The preparatory studies seemed to show a decrease in deaths from tuberculous meningitis and in the influence of tuberculous infection on infant mortality. In these same studies, 94–97 per cent of the vaccinated persons became tuberculin positive (and 90 per cent of them remained so after two years); while in the large-scale program the percentage of

persons who became allergic is considerably lower and quite irregular. This fact, together with Palmer's studies, clearly point to the necessity of determining the deterioration that the vaccine suffers in the conditions of our climate.

The number of beds for tuberculous patients do not exceed 6,000 with deaths still between 8,000 and 10,000 a year. The deficit was obviously greater when we lost over 12,000. No minister of finance who thinks clearly will provide 2 or 3 specialized beds for every annual death when the total number of hospital beds for all purposes is less than 30,000. Though we were conscious of the fact that tuberculosis was decreasing, we could not very well

FIGURE 2—Tuberculosis deaths by age groups, specific death rates per 100,000 population, 1917–1949, Republic of Chile



wait for the events to take their natural course. Here the vaccination program finds its best justification. In any case, these beds are better used nowadays. Preference in admittance is given to patients who can be benefited by surgery and also to those who are socially more dangerous because of the overcrowding at home or because they have several children among their contacts. The authors do not know of any really reliable study of vaccination in a country going through the epidemic stage and they have been observing and will continue to observe developments with much interest and preoccupation.

Information concerning the isonicotinic acid hydrazide appeared in the daily press, and when it actually arrived people were waiting for it at the airport. The minister of public health appointed a committee to experiment with it before allowing it in the open market, but the pressure was so great that the drug was released after 200 cases were observed for a short period of time. That study and later data seem to prove that the definite advantage of this new proceeding is that of making surgery possible for some cases that were considered as doomed. Chilean specialists are more enthusiastic with the results obtained with streptomycin and PAS.

An iconoclast may possibly say that the evolution of tuberculosis in Chile has been the result of social phenomena and completely independent of the doctor's interference. In the first part of his proposition he might possibly be right. Tuberculosis had some difficulty in colonizing in Chile when the population was scanty and scattered throughout a large territory. Its spread was considerably facilitated by industrialization and the development of cities. Now the disappearance of the most vulnerable human strains and the betterment of cultural and economic conditions make us a less accessible prey. Due to reasons that are almost unknown but certainly complex, the disease seems to be becoming somewhat more benign and this may have some influence on the success of several of the new drugs.

It may well be that if we had not made the efforts that we made, the havoc of the disease might have been much greater during the epidemic stage from which we are just emerging. Now our task is to conduct and accelerate the natural process. We would be more certain of our ground if the deplacement in age distribution were more marked, but only in the group of 65 years or more is there actual increase in mortality. Notwithstanding, it may be argued that mortality has diminished more markedly in the younger age groups.

COMMENT

Up to 1948 the importance of tuberculosis among the different causes of mortality tended to increase because of the decrease of the mortality for all causes. Now, even its relative importance is diminishing. Chile is just coming out from the epidemic stage of tuberculosis. Mortality that was already decreasing during the last 50 years has been dropping more rapidly since 1948. The only artificial factor that coincided with the change in the curve is the introduction of streptomycin and later of PAS. The number of beds is insufficient but their value is enhanced by using them with discrimination. Economic conditions could hardly permit the ideal number. Preliminary efforts with BCG vaccination are apparently producing beneficial results. It is still too soon to evaluate the large-scale vaccination program. The irregularity and sometimes the low proportion of people who are becoming tuberculin-positive make it advisable to study the influence of the climate on the antigen's potency. In any case, BCG is just one more weapon in the fight against tuberculosis.

Migrant farm labor camps, certain town fringe areas, and a housing project became the locales of a field study to determine the prevalence of Shigella infections and to establish their relationships to a high infant mortality from diarrhea. Epidemiologic implications of revealed Shigella and Salmonella ratios are pointed up.

Diarrheal Diseases in Fresno County California*

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COUNTIES of the San Joaquin Valley have consistently shown a higher infant mortality rate from diarrhea and enteritis than the State of California as a whole for many years prior to this study. Responsible health authorities have been concerned and from time to time there has been considerable public alarm.[1] Available information did not define the nature or extent of the problem, since etiological diagnoses were rare and morbidity records inaccurate. These deficiencies meant that elements essential for intelligent control were lacking. The California State Department of Public Health, therefore, requested the Diarrheal Diseases Study Unit of the U. S. Public Health Service to assist in planning a study which would lead to a better understanding of etiology and frequency of diarrheal diseases in the Central Valley.

Fresno County, centrally located in the San Joaquin Valley and having many local conditions which facilitated initiation of the program, was selected as the site of investigation since its problems were typical of the whole area. This rich agricultural county has a number of crops harvested at various seasons of the year which require large numbers of laborers for short periods of time. Many families move from the Imperial Valley and Arizona through the Central Valley to northern states during the spring and summer following the seasonal maturation of vegetable crops, returning to the Central Valley in the fall for cotton picking on their way back to the southern part of the country where the cycle begins again. This migrant group, having no permanent home, has been particularly affected by diarrheal disease.

Previously demonstrated facts pertinent to this problem may be summarized briefly. Diarrheal diseases are caused by many etiological agents, some known, some unknown. Severe diarrheal disease

* This study was supported in part by the Office of the Surgeon General, Department of the Army, through the Commission on Enteric Infections of the Armed Forces Epidemiological Board.

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is commonly caused by infection with a member of the genus Shigella. In turn, shigellosis has constituted a major part of the problem in all areas studied that were characterized by relatively high diarrheal disease morbidity and mortality rates. Shigellosis is not equally distributed through communities but occurs more commonly where such indexes as income, housing, and sanitation are below the community average. In addition, studies of normal population groups have demonstrated characteristic curves of Shigella prevalence, age and seasonal distribution in areas where shigellosis is a major problem. Similar, though less extensive data are available for communities where the disease is of minor importance. Analogous data on the incidence of diarrheal disease also are available.[2-9]

Known facts about diarrheal disease in the Central Valley were: deaths were almost exclusively in children, a large proportion between six months and two years of age, and these children belonged, in general, to families in the lowest income groups, living in areas with incomplete or no community sanitary facilities. These facts were compatible with a presumptive diagnosis of shigellosis as a major factor in the problem. An important objection to this diagnosis was the relatively small number of Shigella isolations reported from diagnostic laboratories in the area.

This objection could have been met directly by a study of sick children as seen in practice. Some indication of the fact that Shigellas could be found in Fresno and other areas of the Central Valley when looked for carefully in patients was obtained in 1949.[10] The practical difficulties of such a study together with the limited application of the results led to another approach. It was decided to conduct a normal population survey to measure the prevalence of shigellosis. These data and the incidence of diarrheal disease in the families studied would establish the importance of shigellosis in the study area since they would permit a comparison of the findings with those of other areas in which Shigella prevalence had been related to diarrheal disease morbidity and mortality. Thus, the presumptive diagnosis would be tested and data collected by these surveys would be applicable directly to planning control activities.

PLAN OF STUDY

In preliminary discussions of this study, two approaches appeared possible: (1) to set up a complete unit for investigation of diarrheal diseases which would operate independently of existing organizations, or (2) to utilize personnel and facilities of various interested health agencies. The second approach was used for the following reasons. First, the results of this study would need to be applied as soon as possible after definitive results had been obtained. The effectiveness of application would be directly proportional to the extent that the working health organizations had participated in the study and were aware of the results. Permanent employees of the laboratory, nursing, and sanitary staffs of the health departments would be trained in the study methods used. Immediate use in their usual jobs would result and participation by these workers in various civic organizations would mean that relatively prompt development of indicated community control programs would follow. An informative report on the extent of such application was given in a recent article by Issler.[11] Second, a number of these agencies were interested and working on the problem for various reasons. Operating budgets of these agencies provided the opportunity for immediate action. It was agreed that the first method of approach would possibly be more efficient in direct operation, but the factors in favor of the

second would more than offset this possible advantage.

Agencies which finally contributed to this study are:

1. Fresno County
   a. County Health Department
      (1) Nursing Services
      (2) Sanitation Services
      (3) Laboratory Services
2. California
   a. State Department of Public Health
      (1) Division of Local Health Services
      (2) Bureau of Maternal and Child Health
      (3) Bureau of Acute Communicable Diseases
      (4) Division of Laboratories
      (5) Bureau of Vector Control
3. Federal
   a. Public Health Service
      (1) National Institutes of Health, National Microbiological Institute, Laboratory of Infectious Diseases
      (2) Bureau of State Services, Communicable Disease Center, Epidemiology Branch
   b. Armed Forces Epidemiological Board, Commission on Enteric Infections.

All of these shared some responsibility for the investigation and control of diarrheal diseases and agreed to assist in this study.[12] Personnel, funds, and equipment were thus assembled.

SCOPE OF OPERATIONS

The survey was designed to determine the prevalence of Shigella and Salmonella infection in the portion of the population which had experienced the largest number of deaths from diarrheal disease in recent years. This group of people were, for the most part, residents in either farm labor camps or "fringe areas" of the cities and towns of the county.

Families selected for study were classified primarily according to the nature, location, and ownership of their living quarters. Tabulations and discussions which follow will refer to three groups described in more detail below, called for convenience, camps, town fringe areas and housing projects.

1. *Camps*—Labor camps were housing areas owned by growers or community organizations located in or near farming districts producing seasonal crops. Rent was free or nominal in amount. Usually housing in any one camp followed a uniform pattern, but variation between camps was sometimes very great (*vide infra*). Better camps had well built, small homes with adequate sanitary and related facilities. On the other hand, some were simply clusters of shacks or tents with a minimum of sanitation. Pure water was available in all, but the distribution system varied from a complete bath and kitchen in the better camps to a few public faucets in poor camps. The latter group had privies as the only sewage disposal system. Residence was restricted to agricultural workers.

2. *Town-fringe areas*—Groups of dwellings near the edge of towns usually owned by the occupants, but because of low income they were of poor construction and crowded together. Sewer lines were lacking, but city water of good quality was available to all through community faucets and to some in individual homes. These fringe areas were in general quite similar to each other. There were no occupational restrictions on residence, but a majority of the inhabitants were agricultural workers; the remainder, for the most part, were unskilled or semiskilled laborers.

3. *Housing projects*—These were community sponsored housing areas publicly owned. Well built, individual family dwellings or apartments were the rule with good plumbing in each unit. Families were, on the average, in a higher income group than those found in camps and town fringe areas. Some were agricultural workers; others were engaged in clerical and similar occupations. The housing project families were selected for comparison with the camps and town fringe areas since relatively few severe diarrheal diseases had occurred in such projects; while both camps and town fringe areas had a recurrent problem due to these disorders.

A fourth group of families was studied for a short time because of convenience. These families attended child health conferences operated by the County Health Department. No consistent housing pattern existed but, in general, families served by these conferences were from low-income groups.

Once a camp, town fringe area, or housing project had been selected for

study, an attempt was made to obtain the participation of all resident families. This generally resulted in from 80 to 90 per cent cooperation. None of the families in attendance at the observed child health conferences failed to participate.

METHODS

A. *Prevalence of Infection*

The prevalence of Shigella and Salmonella infections was determined by a method used previously in several field studies,[6, 7, 13] consisting of rectal swab cultures obtained from children 10 years of age and under in homes and clinics. Material on the swabs was plated immediately to one SS agar plate and the swab was placed in a tube of tetrathionate broth (2 ml.). Plates and broth cultures were returned to the laboratory for incubation. Suspicious colonies were picked from SS agar plates to triple sugar iron agar slants following 24 hours incubation. The plates were incubated for another 24 hours at room temperature and picked again in an attempt to increase the positive findings. Tetrathionate broth cultures were streaked on SS agar after 24 hours incubation. These plates, in turn, were "fished" following the same routine as for the original SS agar plates.

Bacterial colonies which gave the proper reactions in triple sugar iron agar were submitted to two coarse screening tests: (1) semisolid mannite agar for checking motility and acid production, and (2) urea agar. The remainder of the biochemical tests were performed by the Fresno County Public Health Laboratory and the final definitive typing * was done at the California State Division of Laboratories. The field laboratory staff was thoroughly indoctrinated in methods used in previous surveys to insure comparability of results.

* *Shigella alkalescens* was identified when found but has been *excluded* from all tabulations of Shigella prevalence.

B. *Incidence of Diarrheal Disease*

Home visits to all families in the study were used to obtain illness records. Information was obtained and recorded as nearly as possible in the informant's own words. Questions about diarrheal disease were asked in a uniform manner, with the use of colloquial synonyms whenever negative replies were obtained to initial questions. All reported diarrhea was recorded together with a list of symptoms. Reported cases which occurred in some other area than that being studied were excluded from all tabulations recorded here. A form was utilized which had been developed by the Public Health Service for particular studies in Texas.[8] Some families were visited one time only and the visit was timed to occur during the week after cultures had been taken. Many groups of families had cultures taken at intervals of from four to six weeks. In each of these groups a record of illness since the last visit was also obtained. Interviewers were given a detailed series of instructions before histories were taken on the use of forms and on methods of asking questions. Incidence rates are based on diarrheal disease occurring in the study area and reported for the six weeks prior to the interview.

RESULTS

Collection of information began early in July, 1950, and continued for six months. The results are analyzed below under the following headings: prevalence of infection, comparison of Fresno County prevalence rates with other areas, and incidence of diarrheal disease.

Prevalence of Infection—Table 1 gives the total survey cultures taken, number of Shigellas found and computed prevalence rates for the four different population groups under study. Data for child health conferences and housing projects were obtained in July and August, those for camps and towns were for the entire six-month period of

TABLE 1

Survey Cultures in Four Population Groups with Prevalence Rates for the Genus Shigella, Fresno County, Calif., July–December, 1950

Population Group	Total Cultures	Shigella	
		No. Positive	Per cent Positive
Camps	3,624	222	6.1
Towns (Fringe Areas)	2,574	100	3.9
Housing Projects	278	1	0.4
Child Health Conferences	589	1	0.2
Total	7,065	324	4.6

TABLE 2

Survey Cultures Taken in Labor Camps and Town Fringe Areas and Shigella Isolations in Each Month, Fresno County, Calif., 1950

Month	Camps			Town Fringe Areas		
	Total	Shigella Positive	Per cent Positive	Total	Shigella Positive	Per cent Positive
July	199	15	7.5	273	16	5.9
Aug.	831	24	2.9	981	30	3.1
Sept.	464	14	3.0	425	19	4.5
Oct.	877	84	9.6	483	27	5.6
Nov.	780	57	7.3	217	1	0.5
Dec.	473	28	5.9	195	7	3.6

TABLE 3

Survey Cultures, July–September and October–December Quarters, in Labor Camps and Town Fringe Areas, Fresno County, Calif., 1950

Population Group	July–September			October–December		
	Total	Shigella Positive	Per cent Positive	Total	Shigella Positive	Per cent Positive
Camps	1,494	53	3.5	2,130	169	7.9
Towns (Fringe Areas)	1,679	65	3.9	895	35	3.9

TABLE 4

Age Distribution of Survey Cultures, Camps, and Town Fringe Areas Combined, and Shigella Isolations, Fresno County, Calif., 1950

Age Group Year	Cultures Taken	Shigella Positive	Per cent Positive
– 1	823	25	3.0
1	746	47	6.3
2–4	2,342	132	5.6
5–9	2,121	112	5.3
10 +	164	6	3.7
Unknown	2	..	..
Total	6,198	322	5.2

TABLE 5

Age Distribution of Survey Cultures, Camps, and Town Fringe Areas Separately, and Shigella Isolations, Fresno County, Calif., 1950

Age Group Year	Camps			Town Fringe Areas		
	Total	Shigella Positive	Per cent Positive	Total	Shigella Positive	Per cent Positive
– 1	532	19	3.6	291	6	2.1
1	455	40	8.8	291	7	2.4
2–4	1,408	86	6.1	934	46	4.9
5–9	1,130	72	6.4	991	40	4.0
10 +	97	5	5.2	67	1	1.5

the study. Crude rates presented must be corrected for seasonal variation in prevalence as well as for differences in age composition of the various population groups before specific conclusions are drawn.

Survey cultures and Shigellas obtained from residents of labor camps and from fringe areas of towns in Fresno County are shown in Table 2 by month for the six-month period, July through December, 1950. Somewhat higher rates seen in both town fringe areas and camps in July compared with August and September suggest that these early cultures measured the latter part of a seasonal high commonly encountered in the United States in the spring and early summer in mild climates. There is evidence of an increase in rates in labor camps in October which continued for some time, but the short duration of this study precludes any definite interpretation of these variations as true indications of a consistent seasonal trend.

The fall increase in prevalence of Shigella infection in labor camps is emphasized when the rates are grouped by quarters (Table 3). The rate for labor camps in the July–September quarter was doubled in the October–December quarter (3.5 per cent to 7.9 per cent). On the other hand, the town rates were the same for both periods (3.9 per cent to 3.9 per cent) and at a level comparable with that seen in the earlier period in the camps. The statistically significant difference in rates observed between the two population groups ($P = 0.0001$) for the entire period is thus the result of high rates observed in the camps in October, November, and December.

Survey cultures were principally from children under 10 years of age, the distribution by age group being shown in Table 4. Observed rates varied from 3.0 per cent positive in the first year of life to 6.3 per cent in the second year with a slight decline in prevalence for the next few years.

Similar data are shown in Table 5 for camps and town fringe areas separately. The difference in rates between the two areas is apparent not only in the totals shown above but also in each age group examined.

Prevalence rates for children observed in housing projects and in child health conferences were significantly lower than those found in either the town fringe areas or the camps during a comparable period of time. Data supporting this conclusion are in Table 6 which shows the age distribution of the children cultured in child health conferences and in housing projects. The age-specific infection rates found in town fringe areas and in camps during July and August are applied to the other two populations in order to obtain theoretical (or expected) infections, i.e., the number of infections expected if no

TABLE 6

Comparison of Prevalence Observed in Child Health Conferences and Housing Projects with Theoretical Prevalence Derived from Observations in Town Fringe Areas and Camps

Age Group Year	Child Health Conference				Housing Projects			
	July and August		Theoretical Prevalence Applying 2 month rates		July and August		Theoretical Prevalence Applying 2 month rates	
	Total Cultures	No. Positive	Fringe Areas	Camp	Total Cultures	No. Positive	Fringe Areas	Camp
— 1	179	1	1.4	..	27	..	0.2	..
1	99	..	3.0	1.9	23	..	0.7	0.4
2–4	190	..	8.9	7.9	108	..	5.1	4.5
5–9	78	..	3.1	4.3	107	1	4.3	5.9
10 +	3	..	..	..	12	..	..	..
Not Stated	..	..	..	..	1	..	..	..
Total	549	1	16.4	14.1	278	1	10.3	10.8

difference in rates existed. If the town fringe area rates had occurred, 16 positives would have been expected in the child health conference group as compared with a single observed positive. Similarly, in housing projects, 10 positives would have been expected but only one was observed. Entirely comparable differences were found when the camp rates were applied similarly. This relative scarcity of Shigella infection in housing project and child health conference families was established by the end of August so that investigation of these families was discontinued to free laboratory and interviewer time for more intensive study of groups where important amounts of shigellosis had been found.

The low prevalence rate found in housing projects is consistent with observations made relative to much larger geographic areas. Shigellosis has virtually disappeared from communities in the United States with a uniformly high level of sanitation and housing. The shift from high to low prevalence occurs during a period of general improvement and the relative influence of various factors has not been defined because improvements in individual housing, water supply, garbage and sewage disposal, higher standards of living, and better education are usually concurrent and may be accompanied by, or the result of, community-wide changes.

A comparison of prevalence of infection in housing projects with findings in different groups of camps suggests that, in addition to these changes due to interrelated factors, Shigella prevalence may be much more directly influenced by modification of a single sanitary factor than has been demonstrated up to this time.

Table 7 lists the cultures taken in A: housing projects, a moderate-income group with plumbing in each individual housing unit and generally good sanitation; B: camps with housing facilities comparable to A but a difference in socioeconomic level; C: camps with poor housing, without indoor plumbing, but with fewer than 15 people per water outlet; and D: camps like C, but with more than 15 people per water outlet. Thus A and B differed socioeconomically, but were otherwise comparable; B and C were similar economically, but differed with respect to housing and multiple sanitary factors as flush toilets, screening, etc.; C and D were alike in all attributes of economics and sanitation except accessibility of water. Quality of water was comparable in all groups. In Groups A and B, water was in the homes and yards, in Group C, occupants of one or two houses used a faucet in or near their yards for water, and in Group D, water was obtained from a faucet serving a much larger

TABLE 7

Shigella Prevalence Found in Housing Projects and Labor Camps Compared According to Availability of Water Supply and Economic Status

Group	Economic Status	Water Supply	Cultures Taken	No. Positive for Shigella	Prevalence Rate
A	Moderate	In Family Home	278	1	0.4
B	Low	In Family Home	376	8	2.1
C	Low	Out of Home < 15 per Faucet	2,182	116	5.3
D	Low	Out of Home > 15 per Faucet	1,051	97	9.2

"Probability" of a difference as great or greater being due to chance when comparing

A with B = 0.08 (exact probability)
B with C = 0.01
C with D < 0.0001

group of houses with a consequent greater distance from living quarters to water source.

Prevalence rates show a progressive rise from group A to group D, and while the differences shown between individual groups are not all statistically significant, the trend is consistent, conforms with general knowledge, and suggests that these are not simply chance variations. Considered in this light, the difference between *D* and *C* is related to the single factor of water availability or its consequent, water use; the difference between *C* and *B* is related to a combination of water use, better housing, etc., and the difference between *B* and *A* is the result of higher income with the multiple variables associated with a family budget that provides for more than the essentials of food and clothing.

Comparison of Fresno County prevalence rates with other areas—All of these data on Shigella prevalence were collected primarily to provide an objective basis for comparison with other areas of the country in which Shigella prevalence rates have been specifically related to diarrheal disease morbidity and mortality. Data collected by the Public Health Service during the past 15 years in three intensively studied areas are chronologically listed in Table 8; New Mexico 1937–1938 and 1948, Georgia 1939 and 1949, and Texas 1946–1948. The initial study (New Mexico, 1938) showed that in this area of high mortality from diarrheal disease (100 per 100,000), shigellosis caused the majority of these deaths.[6] This fact was also demonstrated in South Georgia, an area of moderate diarrheal mortality (18 per 100,000) in 1939. Both of these areas were studied 10 years later.[8, 9, 14] Diarrheal disease mortality had decreased significantly in both areas (New Mexico 50 per 100,000, Georgia 8 per 100,000) and so had the Shigella prevalence rates. Two levels of Shigella prevalence in Texas were found during diarrheal disease control studies[8]; high rates were those observed in communities without organized fly control, while low rates were from communities with major fly control activities. The prevalence of Shigella infection was shown to be related directly to diarrheal disease morbidity and mortality in the course of the investigations.

Prevalence of Shigella infection in California camps was higher than that seen in Texas, in South Georgia in 1939 and 1949 and in New Mexico in 1948, but somewhat lower than the 1938

TABLE 8

Shigella Prevalence Rates by Age and Year Found in New Mexico, Georgia, Texas, and California

Age in Years	Total	Shigella Positive	Per cent Positive	Total	Shigella Positive	Per cent Positive
	New Mexico, 1937–1938			New Mexico, 1948		
<1	264	17	6.4	1,866	26	1.4
1	56	10	17.9	1,936	78	4.0
2–4	279	36	12.9	3,994	157	3.9
5–9	408	39	14.5	3,631	72	2.0
	South Georgia, 1939			South Georgia, 1949		
<1	127	4	3.2	1,059	10	0.9
1	111	8	7.2	1,235	25	2.0
2–4	322	13	4.0	3,159	71	2.2
5–9	606	23	3.8	2,402	44	1.8
	Texas, No Fly Control, 1946–1947			Texas, Fly Control, 1946–1947		
<1	2,577	43	1.7	2,567	28	1.1
1	2,332	131	5.6	2,411	60	2.5
2–4	5,932	310	5.2	6,274	158	2.5
5–9	4,161	144	3.5	4,331	91	2.1
	California Camps, 1950			California Fringe Areas, 1950		
<1	532	19	3.6	291	6	2.0
1	455	40	8.8	291	7	2.4
2–4	1,408	86	6.1	934	46	4.9
5–9	1,130	72	6.4	991	40	4.0

figures in New Mexico. The fringe area rates, slightly lower than those in the untreated Texas towns, were quite comparable to those seen in New Mexico in 1948 and definitely higher than those observed in Georgia in 1949. Thus, shigellosis rates in one population group in California were second only to the extremely high rates seen in New Mexico almost 15 years ago. (It is significant that diarrheal disease problems in this population group, the residents of labor camps, were a primary factor in initiating these studies.) Prevalence rates in general population groups equal to those seen in the fringe areas have not been observed in the Public Health Service studies in the *absence* of an important diarrheal disease problem nor have there been any such reports in the literature on the subject.

Salmonellosis was a relatively infrequent infection in all California groups studied. A Salmonella was isolated 29 times in 7,065 cultures, a prevalence rate of 0.4 per cent. These positives were proportionally distributed in the various age groups cultured. The numbers were too small to justify any other analyses of the data. The ratio of 11 Shigella to each Salmonella found and a low prevalence rate of Salmonella indicate that salmonellosis was both relatively and absolutely a minor part of the problem in the groups studied.

These facts do not mean that all diarrhea problems are related to shigellosis. They do provide a sound base for the inferences that (a) Shigellas were causing the major portion of diarrheal disease in labor camps and town fringe areas studied and that (b) diarrheal diseases caused by Shigella represent a major public health problem to these two populations.

Incidence of Diarrheal Disease

Additional support for the inferences given above is obtained by consideration

TABLE 9

Diarrheal Disease Attack Rates per 1,000 per Annum by Age Groups in California Camps and Town Fringe Areas (July–December, 1950) and in Texas Untreated Areas (March, 1946–February, 1948)

Age Group	California			Texas		
	Observed Person Months Experience	Cases	Rate per 1,000 P. A.	Observed Person Months Experience	Cases	Rate per 1,000 P. A.
–1	1,275	86	809	4,384	222	608
1	1,206	81	806	4,028	263	784
2–4	3,264	100	368	10,888	224	247
5–9	4,481	75	201	13,612	68	60
10–14	3,659	35	115	11,036	30	33
15–34	9,056	94	125	31,696	81	31
35 +	6,326	88	167	23,462	76	39
Unknown	355	2		230	2	
Total	29,622	561	227	99,336	966	117

of incidence of diarrheal disease found in these same California populations. Table 9 lists age-specific attack rates observed in camps and town fringe areas in California during the period of study. Since prevalence rates found in California were most nearly like those from the Texas area without fly control, incidence figures for this area are provided for comparison. The similarity of reported incidence of diarrheal disease in the two areas is remarkable. Just as prevalence rates of Shigella infection were slightly higher in each group in California, so were incidence rates of diarrheal disease.

One further comparison is particularly interesting in light of higher shigellosis prevalence in camps than in town fringe areas during the quarter from October through December shown in Table 3. The reported incidence of diarrheal disease (Table 10) remained relatively stable in the fringe area populations and a marked increase was recorded for the camp residents. The increase affected all age groups, not just the younger group for which prevalence data were available. The two population groups in camps and town fringe areas were quite comparable in average income, and similar respects, but important differences were noted. Camp populations in July, August, and September were small isolated groups who remained after seasonal emigration; crowding was marked in occupied houses, but a large percentage of the houses were vacant and relatively few new residents were moving into the areas. In October, the fall immigration was in full force and a tremendous in-

TABLE 10

Quarterly Attack Rates for Diarrheal Disease; Adjusted for Age; Camps and Town Fringe Areas per 1,000 per Annum

Area	All Ages Combined		Less than 10 Years	
	July through September	October through December	July through September	October through December
Camps	67	526	107	913
Town Fringe Areas	303	214	559	455

crease in camp populations occurred. Population in the town fringe areas was, by contrast, quite stable. These families were never so isolated as were camp populations in midsummer, nor did the crowding ever approach the intensity seen in the camps in the fall.

Rises in reported diarrheal diseases and in prevalence of infection found in camps following increase in crowding bring to mind similar observations in institutional populations. In a study of institutional inmates,[15] it was observed that new admissions to a group infected with Shigella experienced a significantly higher incidence of clinical disease in the beginning and, as time went on, continued to show a higher infection rate than the portion of the group in residence longer. Further Shigella infection was shown to recur in epidemic form in one group to which new inmates were being added at a fairly rapid rate; whereas in another group, similar in size but with few new admissions, infection continued to spread at a low, even rate without recurrent epidemics. The comparison of camp and town fringe area populations to these institutional populations receiving new susceptibles at different rates provides an intriguing explanation of differences in observed reaction to infection in California.

DISCUSSION

The prevalence of Shigella found in two population groups in Fresno County was equal to or greater than that observed in several sections of the country in which such rates had been demonstrated to be directly related to morbidity and mortality from diarrheal disease. It was further shown that in these comparison areas, reduction in prevalence, either the result of long-range nonspecific improvement or the result of community activity specifically directed toward diarrheal disease control, was accompanied by proportional reductions in morbidity and mortality from diarrhea.

Diarrheal disease mortality in New Mexico and Georgia declined 50 per cent over a 10-year period and comparable reductions in shigellosis were noted. Prevalence rates reliably reflected mortality changes in these two areas. Similarly, prevalence, morbidity, and mortality were equally effective indexes of change brought about by community activities in Texas.

Thus, crude mortality figures are useful measures of the relative importance of shigellosis even in populations having only broad similarities, but serious misinterpretation can result from the use of such data when major disproportions in the populations at risk are involved. This danger is illustrated perfectly by a comparison of Fresno County diarrhea mortality rates with those reported for Hidalgo County, Tex., the area reported on above. The populations studied in these two counties had similar prevalence and incidence rates in contrast to reported mortality from diarrheal disease in Fresno County of 20 per 100,000 and 250 per 100,000 in Hidalgo County in 1949.

The apparent contradiction is accounted for largely, if not entirely, by the difference in total population at risk. The compared incidence and prevalence rates were obtained from populations believed to be at greatest risk of enteric infection. In Hidalgo County at least three-quarters of the population belonged in such a group; in Fresno County the population at risk was a decided minority, even at times of peak density and a large part of this group was present only for short harvest periods.

Counties or states may show steady decline in mortality rates and attain a level which compares favorably with the country as a whole, but have improvements which apply so disproportionately to citizen groups that some suffer disease

rates comparable to those seen 50 and more years ago.

Health officers who wish to define and effectively attack a diarrheal disease problem need to know the frequency of occurrence of infection specific for various groups of citizens in their jurisdiction. They also need to be able to speak, for very practical reasons, in terms of numbers of sick people and of deaths. Shigella prevalence rates are much more useful to them when translated into morbidity and mortality due to Shigella.

formula then becomes $P = \frac{I \times D}{R}$, and solved for I, it is $I = \frac{P}{D} \times R$.

Table 11 shows the essential information and results of such a computation in columns 1 through 4. The prevalence rates (Column 1) given are those found in camps and fringe areas in the study. The duration of infection (Column 2), four weeks, or 1/13 year, is an average found in institutional groups in which

TABLE 11

Computation of Expected Cases of Shigella-Caused-Illness from Prevalence Rates Found by Population Survey

Column	*1*	*2*	*3*	*4*	*5*	*6*
Age in Years	*Prevalence of Infection Per 1,000* [1] *P*	*Average Duration of Infection in Years* [2] *D*	*Shigella Disease/ Infection* [3] *R*	*Computed Shigella Disease Rate/1,000 P. A.* [4] *I*	*Person Yrs. Experience* [5] *Y*	*Computed Shigella Disease Expected Cases* [6] *E*
<1	30	1/13	9/10	350	106	37
1	63	1/13	2/3	590	100	59
2–4	56	1/13	2/5	290	272	79
5–9	53	1/13	1/4	170	373	63
Total						238

1. P—from Table 4
2. D—Watt [37]
3. R—Watt and Hardy [7]
4. $I = \frac{P}{D} R$
5. Y—from Table 9
6. $E = YI$

Information needed to make such a conversion from prevalence of infection to incidence of disease is available from several sources and is brought together below. As stated by Densen,[16] "The general relationship of *prevalence* (P) and *incidence* (I) may be expressed as $P = I \times D$ when D is the average *duration* of disease in an individual case expressed in the same time units as I." An additional factor is needed in the formula when infection does not consistently result in disease and the known P is prevalence of infection. This factor is the ratio of individuals sick from the infection to the total number of infected people which will be called R. The untreated shigellosis was observed by daily stool cultures.[17] The ratios (R) of infected individuals having diarrheal disease to total infections is available from a study of normal populations.[7] Substituting these values in the formula for each age group and solving (Column 4) gives the expected incidence rate *due to Shigella* corresponding to discovered prevalence.

It is perhaps unnecessary to point out how these computed rates (I) can be used. Nevertheless an example is included in the table (Table 11) using person-years experience (Y) (Column 5) in the population studied in Fresno County. Multiplication of the popula-

tion in each group by its corresponding computed incidence rate of Shigella disease (I) gives the number of cases of *Shigella diarrheal disease* expected (E) in the population when they suffer from such rates. Total expected cases derived in this manner is 238 and our survey recorded 342 cases of diarrheal disease from all causes. (Table 9, under 10 years of age.) The ratio of Shigella diarrheal disease (computed) to total diarrheal disease (reported on survey) is 238–342 or 70–100. For practical purposes, crude rates, which have the virtue of simplicity of computation, may serve equally well if used with recognition of the potential inaccuracies of interpretation. The decided difference in the ratio of sick to well from one age group to another could easily result in a misleading product where major disparities in age distribution exist. Crude rates for this example ($P = 52$, $R = 1/2.5$, $Y = 851$) give expected cases as 230, an equally useful value.

How then does this ratio (70 cases of Shigella diarrhea to 100 total diarrhea cases) obtained by computation, compare with the results of specific etiological studies of the acute diarrheal diseases by various workers over a period of years? The resemblance is striking. The proportion of acute diarrheal disorders found positive for Shigella as reported by Flexner and Holt,[2] TenBroeck and Norbury,[3] Davidson,[4] Hardy and Watt,[6] and Watt [18] varied from 60 to 75 per cent. An even greater proportion of the diarrheal disease deaths reported in the literature cited were caused by shigellosis. Thus it would be reasonable to conclude that if shigellosis were eliminated from camps and town fringe areas, the diarrheal diseases currently found would be reduced by two-thirds and deaths by an equal or greater amount. Direct confirmation of this reasoning is found in the Texas studies [8] cited. Shigella prevalence rates and diarrheal disease incidence were quite similar to Fresno County rates. Community activities directed against spread of Shigella resulted in a reduction in the prevalence of these organisms. Diarrheal disease morbidity and mortality rates fell at the same time to approximately the extent expected from the computations.

SUMMARY

This study was designed to provide a better understanding of the etiology of diarrheal diseases in the Central Valley in California. Rates of Shigella infection were determined in normal populations of representative areas (labor camps and fringe areas of towns) having the greatest number of reported diarrheal deaths in recent years. For comparison, a population (housing projects) in which diarrheal disease mortality was not considered to be important was selected. A distinct difference in prevalence rates was found in this comparison. Shigellosis demonstrated in camps and town fringe areas was equivalent to or greater than the prevalence reported from most of the areas in which a major portion of diarrheal disease morbidity and mortality was caused by Shigellas. It was inferred from these comparisons that shigellosis was of similar importance in the California populations having this high prevalence rate.

Incidence of diarrheal disease discovered in the course of these investigations supported these inferences, since the relationship of incidence to prevalence was consistent with that reported in other studies of etiology.

Variations in prevalence demonstrated in labor camps suggested that the problem in these groups was analogous to that seen in institutional populations since a major increase in prevalence of Shigella and incidence of diarrheal disease occurred following immigration of large numbers of workers (new susceptibles) for the fall harvest. Further,

data suggested that modification of a single environmental factor, water use, may significantly lower Shigella prevalence when the risk of acquiring this infection is great.

The relationship of Shigella infection to disease caused by this genus is discussed and illustrated by a computation using discovered prevalence, P; duration of infection, D; and the ratio of sick individuals to total infections, R. Rates thus determined led to the estimate that 70 per cent of the discovered diarrheal disease in these camps and town fringe areas was due to Shigella. The significance of this computed percentage is enhanced by comparison with etiological studies in the literature which have shown 60 to 75 per cent of acute diarrheal disorders to be caused by Shigella.

REFERENCES

1. Coke, J. Earl, and Prasow, Paul. *Agricultural Labor in the San Joaquin Valley.* Final Report and Recommendations by The Governor's Committee To Survey the Agricultural Labor Resources of the San Joaquin Valley. Sacramento, California, March 15, 1951.
2. Flexner, Simon, and Holt, L. Emmett. *Editor's Bacteriological and Clinical Studies of the Diarrheal Diseases of Infancy with Reference to B. dysenteriae.* Monograph O. New York: The Rockefeller Institute of Medical Research, 1904.
3. TenBroeck, C., and Norbury, F. G. *B. dysenteriae* as a Cause of Infectious Diarrhea in Infants. *Boston M. & S. J.* 174:785, 1916.
4. Davidson, W. C. Bacillary Dysentery in Children. *Bull. Johns Hopkins Hosp.* 31:255, 1920.
5. McGinnis, G. Foard, McLean, A. L., Spindle, F., and Maxcy, K. F. A Study of Diarrhea and Dysentery in Henrico Co., Virginia. *Am. J. Hyg.* 24:552, 1936.
6. Hardy, Albert V., and Watt, James. Studies of the Acute Diarrheal Diseases. XII. Etiology. *Pub. Health Rep.* 60, 3:57–66 (Jan. 19), 1945.
7. Watt, James, and Hardy, Albert V. Studies of the Acute Diarrheal Diseases. XIII. Cultural Surveys of Normal Population Groups. *Ibid.* 60, 10:261–273 (Mar. 9), 1945.
8. Watt, James, and Lindsay, Dale R. Diarrhea. Disease Control Studies. I. Effect of Fly Control in a High Morbidity Area. *Ibid.* 63, 41:1319–1334 (Oct. 8), 1948.
9. Lindsay, Dale R., Stewart, William H., and Watt, James. Diarrheal Disease Control Studies. III. Effect of Fly Control in an Area of Moderate Morbidity. (In press.)
10. Drake, T., and Long, Howard. Summer Diarrhea in the San Joaquin Valley. *California Med.* 73, 6:500–502 (Dec.), 1950.
11. Issler, Anne Roller. Something for the Joads. *Survey* (May), 1952.
12. Stein, William F., Beck, M. Dorthy, Hollister, Arthur C., Jr., and Mortenson, Earl. The Organization and Operation of a Study on Diarrheal Diseases in Fresno County. *California Med.* 75, 2:94–97 (Aug.), 1951.
13. Hardy, Albert V., and Watt, James. Studies of the Acute Diarrheal Diseases. XVIII. Epidemiology. *Pub. Health Rep.* 63, 12:365–378 (Mar. 19), 1948.
14. Watt, James, and Walton, Mary. Unpublished data.
15. Hardy, A. V., Shapiro, R. L., Chant, H. L., and Siegel, M. Studies of the Acute Diarrheal Diseases. IX A. *Shigella dysenteriae* Infections Among Institutional Inmates. *Pub. Health Rep.* 57, 30: 1079–1102 (July 24), 1942.
16. Densen, Paul M. *Rosenau Preventive Medicine.* (7th Ed. Kenneth F. Maxcy, Ed.) New York: Appleton-Century-Crofts, 1951, p. 1319.
17. Watt, James. Unpublished data.
18. ———. The Diagnosis and Treatment of Acute Diarrheal Disorders. *New Orleans M. & S. J.* 97:10 (Apr.), 1945.

Health workers who may be experienced in fields other than toxicology will find useful background material—especially in the introductory and summary sections of this paper—upon which to base their opinions in matters of air pollution. With our rapidly expanding industrialization more and more of us will become embroiled in arguments over this worsening hazard to urban health.

Toxicologic Perspective in Planning Air Pollution Studies*

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AIR pollution is so much with us and the public clamor against it so loud that investigators are being pushed into expensive and time-consuming studies of the problem. There are obvious reasons for the clamor. The public daily notes poor visibility, and is often irritated by unpleasant odors and by burning eyes; it is, moreover, keenly aware that acute disasters from smog can occur. It is therefore natural that concern is mounting over the possibility of long-term chronic effects on health, especially now that all the known chemical compounds are being expelled into the air by a widely diversified industry. Logically, the public reasons, if acute episodes have happened, may not the lives of city dwellers be injured or shortened from living continuously in the presence of chemical agents the same as or similar to those that brought on acute disaster? Investigators meanwhile are confronted with vexing questions. Is health actually injured or even endangered from continuous low-grade exposures to chemical substances in the air? If so, how can such substances be recognized and their effects differentiated from those of other agents of disease? How can evidence best be obtained? No precedent or blueprint exists in medical annals of the manner of proceeding to obtain answers to the above questions. Indeed, according to some who have given the problem serious thought, there is no assurance that such an investigation would lead to results of value. On the other hand, there are some, believing the solution possible, who have begun a small-scale study of the problem.

The present discussion is concerned with what toxicology can offer in shaping the direction and course of studies of effects of air pollution on urban health, so that efforts may not be misdirected or wasted. A critical evaluation will be attempted of past studies of acute and chronic air pollution incidents and of current investigations, and pertinent toxicologic information will be presented. Already, some air pollution studies have reached a point where realistic planning for a medical study of urban health is opportune.

LESSONS FROM PAST ACUTE AND CHRONIC EPISODES

Acute Disasters—Five such incidents have now been recorded: two Belgium

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Meuse Valley incidents of 1915 and 1930; two Donora episodes of 1945 and 1948, and one at Poza Rica, Mexico, in 1950. However, detailed reports, sufficient for critical evaluation, are available on but three: the 1930 Meuse Valley incident,[1] the second Donora episode in 1948,[2] and the Poza Rica study.[3]

Review of the scientific reports on the causative agents for the Meuse Valley smog disaster reveals several facts important to present-day air pollution program perspectives. Despite occurrence of the incident in December of 1930, scientific controversy was still raging on the identity of the causative agents as late as October, 1933! Because certain articles were still attributing the toxicity of the fog to fluorine compounds, chiefly hydrogen fluoride, the last report on the subject attempted to explain why the "theory" of the role of fluorine could not be maintained. The final adjudicators, who had served as technical experts during the coroner's inquest, excluded fluorine on the basis of insufficient source, and inclined to the view that sulfur compounds had been released in far greater quantities. For our purpose the important fact to note is that the *identity of the agents responsible for the fatality and injury was never conclusively determined.* There were, however, plausible grounds for admitting the role of irritant gases in the disaster.

It seems highly significant to the author that a remarkably similar conclusion was reached in the Donora study of 1948. The Donora episode was far more extensively investigated than the Meuse incident and was approached with more modern technics; moreover, the investigators had the benefit of knowledge of previous incidents, nevertheless, the identity of the offending agents could not be expressed in terms more precise than "no single substance but rather the combined action of two or more agents were responsible" for the injuries sustained. Emphasis again was given to the irritant gas sulfur dioxide as a probable injurious agent. The investigators of the Donora study were, furthermore, plagued by the vexing fact that they were unable to demonstrate by direct analysis of the air or by *a posteriori* extrapolation of concentrations of the toxic agents that any were in excess of normally allowable limits, to say nothing of injurious or lethal concentrations.* Similarly low, though somewhat more elevated, concentrations of contaminants were calculated to be present during the Meuse incident.†

One of the more important questions to explain, therefore, is how toxic agents in the form of irritant gases can produce widespread injury and mortality at smog concentrations below levels known to produce such effects normally. Assuming that the extrapolated or calculated values of irritant gases are approximately correct, the following explanation is presented as suggestive of a partial solution.

It is now well known that the greatest number of fatalities and the most severe illnesses at Donora occurred among the older age group and among those with heart disease, bronchial asthma or chronic bronchitis, or pulmonary emphysema. These groups of individuals belong to a class especially susceptible to changes in air composition. The death of persons so afflicted may be

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* The calculated air concentrations of sulfur dioxide extrapolated from determined values at Donora during the time the fog was lifting was of the order of 0.5 ppm; the MAC value is 10 ppm; lethal values approximate 100 ppm for short exposures.

† The calculated air concentrations of hydrogen fluoride in the Meuse Valley during the days of the fog was 0.5 ppm. The maximal allowable concentration of hydrogen fluoride is 3 ppm; irritating but respirable concentrations are 15 to 20 ppm; lethal concentrations are of the order of 100 or more ppm for exposures of brief duration. The estimated air concentration of sulfur dioxide in the Valley was 8 ppm and possibly may have arisen as high as 40 ppm, although of course, direct evidence on this and other points is lacking, unfortunately here as in all studies of acute episodes.

hastened by minimal exposure to no more specific agents than irritant gases. It has been postulated that death in these persons is caused under normal conditions by an acidosis produced by inability to eliminate carbon dioxide. Under conditions of exposure to irritant gases there is an even greater inability to eliminate carbon dioxide, due to the constricting effect of the gases on the bronchioles, and therefore an even greater tendency to develop acidosis. Because all irritant gases irrespective of chemical nature act uniformally in this manner, it is difficult to identify specifically any one air pollutant as the causative agent.

Contributory explanations may also center on other natural factors occurring in smog conditions. Among these are the effects of combinations of irritant gases plus other agents (asphyxiants or toxic metals), or the absorption of such gases on particulate material (catalytic effect). Such combinations could well potentiate the effect of any one individual substance. One such experimental piece of evidence has already been reported[4]; hydrogen fluoride enhanced the lethal action of beryllium when inhaled by animals at concentrations at which neither was lethal alone. Another report[5] has shown styrene in the presence of bromine to be more injurious than either alone. Such findings again indicate the difficulty of detecting precisely the offending toxic agents in the air.*

Chronic Episode—One instance of long-term effects on community health by a chemical air pollutant has recently been brought to light.[6] In a small industrial city, a beryllium manufacturing plant had since 1943 been discharging into the community atmosphere certain beryllium particulates that by 1951 gave rise to 16 cases of chronic beryllium poisoning. Five of the persons affected have died to date. Because of the radial distribution of the cases the source of the poisoning was unmistakably traced to the beryllium plant. What is important to the present discussion is the fact that an extremely minute concentration of beryllium in the air brought on the disease. According to best estimates derived from air analyses and from calculated stack output and fallout, beryllium levels were of the order of 0.01–0.1 $\mu g/m^3$ of air. For a metal upon inhalation to produce such devastating effects, this is an astoundingly small concentration. No other chemical element with the exception of the radioelements, has yet been shown to act with such fatal effects at so low a concentration. If it is granted that other metallic elements, which currently exist in the atmosphere of industrial cities, may also be injurious at low concentrations, then there may be cause for concern of health. The true importance of this single chronic occurrence is not so much that beryllium can behave in this manner but that a demonstration has been made that air pollutants can have chronic effects on health.

LESSONS FROM CURRENT STUDIES

Character of Chemical Air Pollutants—Three tables have been drawn up to present a realistic picture of the atmospheric pollutants in some of our cities. These show both the character and the amount of (1) total chemical air pollutants so far as these have been discovered to date, (2) 20 of the most prevalent metallic air pollutants from three cities' samples and analyzed in a semiquantitative manner, and (3) eight of the most prominent metallic air pollutants according to area of two large industrial cities.

Table 1 shows that organic matter comprises the major air contaminant,

* The recent Poza Rica incident of November, 1950, is excluded as not being germane to the present discussion because of its peculiarly local character. Here hydrogen sulfide, an asphyxiant gas, from natural gas operations was fairly conclusively demonstrated to be the cause of localized fatalities and illnesses.

TABLE 1

Major Group Constituents in Industrial Atmospheres
Data Chiefly from the City of Los Angeles

Constituents	*Approximate Concentration Range * mg./m³*	*Approximate Per cent of Total*
Solid Particulates	0.2 – 1	0.5– 2.5
"Carbon"	0.04– 0.4	
Metals	0.01– 0.1	
Tars and Oils	5 –20	10 –50
Gasoline	5 –10	
Oil	0.5	
Ketones and Aldehydes	1 –10	
Gases and Vapors	10 –15	25 –40
Organic chlorides	10 –15	
Volatile organics	1 – 5	
Aqueous Droplets	0.5 – 2	1 – 4
SO_2	0.5 (ppm)	
SO_3	0.2	
Nitric acid	0.5	
NH_3	0.1	
H_2SO_4	0.04	
Total	15 – 40	

* Includes only those constituents thus far identified

the bulk of which is now considered to be gasoline and organic chlorides; ketones, aldehydes, and acids appear to add significantly to the total organic pollution. Solid particulates and "aqueous droplets" comprise far smaller proportions. According to more recent information (Los Angeles), the values for oxides of nitrogen might be considerably higher than shown. Of the solids, the metals represent a relatively small proportion of the total pollutants, the remainder being chiefly carbon and the various anionic combinations of the metals. The inorganic gases, mostly acidic, have been identified as oxides of sulfur and nitrogen which probably exist in the atmosphere as fine aqueous droplets; ammonia constitutes a relatively negligible quantity. The total pollution load is thus shown to be as high as 40 mg/m³, at least in the one city (Los Angeles) in which such a study has been made. Whether such a high proportion of organic constituents is representative of all large cities remains to be determined.

Metallic Elements—Table 2 shows an analysis of the metallic constituents of the atmosphere of three cities, Detroit, Mich., Windsor, Ont., and the vicinity of Charleston, W. Va. In all instances, the same method of filter paper sampling and spectrographic analysis has been used. The various determinations were made possible through the recent development by the Division of Occupational Health of a rapid, spectrographic scanning method of analysis that permits the determination of more than 20 elements simultaneously with semiquantitative accuracy.[7] It is seen that certain elements, namely, iron, calcium, magnesium, and silicon, comprise the bulk (80–90 per cent) of these constituents. The elements below manganese in Table 2 occur in amounts generally less than 0.1 μg/m³. In comparison with the predominant elements, those of lower concentration are commonly considered the

TABLE 2

Concentration of Metallic Elements in Urban Atmospheres

	Element	Average Values in Micrograms Per Cubic Meter of Air		
		Detroit, Mich.*	Windsor, Ont.†	Charleston, W. Va.‡ and Vicinity
1.	Silicon	3.5	6.4	8.7
2.	Aluminum	3.2	3.0	2.3
3.	Iron	3.0	2.8	0.8
4.	Calcium	2.5	7.8	1.4
5.	Magnesium	0.6	0.9	0.4
6.	Lead	0.4	0.7	0.2
7.	Zinc	0.4	0.3	abs.
8.	Manganese	0.2	0.3	0.13
9.	Copper	0.05	0.4	0.11
10.	Titanium	0.05	0.1	0.01
11.	Tin	0.04	0.06	0.01
12.	Molybdenum	0.03	0.05	0.01
13.	Barium	0.01	0.07	0.03
14.	Cadmium	0.01	0.006	0.002
15.	Chromium	0.008	0.02	tr.
16.	Nickel	0.006	0.03	tr.
17.	Antimony	0.005	abs.	abs.
18.	Vanadium	0.002	0.009	tr.
19.	Cobalt	0.001	tr.	abs.
20.	Beryllium	0.001	0.002	0.001
	Total Concentration of all pollutants	233	210	291
	Metallic elements, per cent	6	11	5
	Elements not found **	As, Hg, Bi, W	As, Sb, Bi	As, Co, Hg, Bi, Zn, Sb, W

* Averaged results of 1,035 filter paper samples during 6-week period
† Averaged results of 82 filter paper samples during 6-week period
‡ Averaged results of 9 filter samples
** Certain of these elements (As, Hg) may fail to be detected owing to their small quantity in the mixture and nature of analytic method

more toxic. Neglecting an occasional variation, one is struck by the uniformity of the results among the three cities. Such uniformity, if substantiated by further study, is of great importance, for it indicates that any industrial area of sufficient size and diversity may possess an atmosphere similar in composition to that of any other city, thus reducing investigational work appreciably. One may also note in Table 3 that the total metallic pollution load in our present state of industrialization lies between limits of 0.2–0.5 mg/m^3.

An interesting comparison of the distribution of certain elements in the atmosphere of two cities according to districts is presented in Table 3. It is seen, as expected, that as one progresses from the residential through the semi-industrial to the industrial area, the total weight of air-borne particles increases. Although this relationship may also hold in a given city for certain elements, such as iron, lead, and aluminum, it may not hold for certain other elements, such as copper, tin, and zinc. Caution should be exercised, therefore, in interpreting *averaged* city-wide pollution data with respect to the degree of inhabitant exposure to a particular substance in a given area, and to the consequent effect on health, plant life, and property.

Distinct seasonal variations were noted in the Cincinnati study, both in regard to total collection and individual elements. Again as might be anticipated, the total concentration was greater in the cold months than that in the summer by a factor of almost two, and particle counts, by a factor of more than four. The fact that many of the

TABLE 3

Concentration of Certain Elemental Constituents in the Atmosphere of Cities According to District

Average Values in Micrograms per Cubic Meter of Air

Element	*Residential*		*Semi-industrial*		*Industrial*	
	*Detroit * and Cincinnati †*		*Detroit * and Cincinnati †*		*Detroit * and Cincinnati †*	
Iron	3.0	6.0	5.4	7.7	7.4	12.7
Aluminum	3.8	2.2	4.6	4.0	5.0	8.3
Silicon	2.6	..	3.7	..	4.1	17.7
Calcium	4.3	..	4.3	..	3.6	5.2
Lead	0.6	1.0	1.0	2.0	0.9	3.7
Zinc	0.2	1.6	0.4	1.3	0.7	2.0
Manganese	0.18	0.2	0.23	0.4	0.3	0.4
Copper	0.11	2.0	0.13	0.8	0.2	1.2
Tin	0.03	0.1	0.04	0.1	0.04	0.1
Total concentration of all pollutants	184	191	279	344	381	472

* Values are the average of 28 samples taken at one representative district for a 6-week period.
† Values are the average of 2, 6, and 7 districts, respectively, sampled during 3-year period.
Detroit values adapted from Keenan and Byers. *Arch. Ind. Hyg. & Occup. Med.* 6, 1952.
Cincinnati values adapted from Cholak, *et al. Ibid.* 2, 1950.

elemental constituents changed only slightly during this time would indicate that coal ash contributed the major portion of the increase during the winter months.

Of considerable value in distinguishing sources of inorganic pollution would be data on the contribution from the soil and from painted surfaces. Some investigators are exploring the possibility that certain soil constituents, becoming air-borne, may give rise to pulmonary disease. One recent report by Cholak [19] of a five-year air pollution study of Cincinnati included some information on the composition of rural air. Although amounts of most metallic elements were less than those found in industrial areas, some were as great as, or even exceeded, those found in the city (Be, Cu, Mg, Ag, Sn, Ti, V, Zn). In no case was an element absent in the country when present in city air. Such findings certainly indicate a careful re-evaluation of past data from industrial and urban residential districts.

Before the effects of metallic pollutants on health may be postulated, information on both their particle size and the nature of their chemical combinations should be at hand. Particles larger than 5 μ in average diameter tend to settle out of the air too rapidly to be breathed in sufficient concentration, and those larger than 2 μ, if inhaled, do not penetrate into the lung in appreciable amount nor long remain there.[8] Cholak [19] found the majority of the particles to be less than 2 μ, very few as large as 5 μ. More important to a health study, the nature of metallic combinations has a decided bearing on the toxicity of an inhaled metal. For example, certain forms of beryllium, such as the silicate, found in ore, or derived from cinders of certain types of coal, have never been implicated in poisoning from this element; whereas the oxide, fluoride, and sulfate of this element are distinctly injurious.

Identified Organic Constituents — Considerable evidence has been adduced by the Los Angeles group of air pollution workers led by Haagen-Smit [9, 10] that the smog constituents responsible for eye irritation as well as for injury to foliage originate from the interaction of ozone or nitrogen oxides on unsaturated hydrocarbons to form organic peroxides or similar oxidized compounds of high irritant potency. Such a discovery represents a great forward stride in air

pollution research, for it is the first time that a definite group of organic air-borne substances have been directly linked with injury to man.

Moreover, through the recent efforts of the biochemist Dixon,[11] an explanation for the manner in which such lachrymators and eye irritants act has been advanced. All lachrymators act on chemical groups common to a number of important enzymes, resulting in inhibition of the activity of these biologic catalysts. This has been shown to be the SH group common to many enzymes. These enzymes in turn, are found at nerve endings. Lachrymation starts at once on exposure to the vapor and continues during exposure with an intensity depending upon the concentration. It recommences upon renewed exposure, but after sufficiently prolonged exposure, it ceases and may no longer be elicited, at which point signs of conjunctivitis make their appearance.

From a basic scientific view, however, an even greater importance may be attached to the findings of the Los Angeles group. These atmospherically formed tissue oxidants resemble in structure and activity the chemical substances now believed responsible for the injury derived from ionizing radiation.[12] These radiation effects are believed to be brought about chemically by the strong oxidizing action of peroxides, HO_2 and OH radicals acting on organic constituents of body cells.

Should a relation be established between the effects of air pollutants and radiation, a mutually beneficial advance may be expected in both areas. For example, means have been found of protecting against radiation injury caused by intracellular oxidants. Use is being made of antireactants in the form of reducing agents (hydrogen donors), such as alcohols and similar substances. A possible mechanism for this reaction has recently been disclosed.[13] The action of these hydrogen donors stimulates catalase, a cellular enzyme, to increased activity, thereby resulting in a more rapid rate of decomposition of the injurious tissue oxidizing agents.

Another organic air-borne constituent which is possibly hazardous is benzpyrene which was recently found in the air of eight English cities.[14] The fact that this well known cancerigenic agent was derived largely from domestic heating fires directs attention away from wholly industrial sources as the origin of all air pollution ills. Evidence directly along this line is accumulating here in the United States. A recent survey of contributory sources of air pollution in the Los Angeles area shows that household burning of trash constitutes the biggest single source of organic air pollution.[15] The long-term effects of these substances on health in the concentrations encountered, however, are largely conjecture at present. In the following section more definitive statements will be made of these effects for certain substances based on well founded toxicologic information.

TOXICOLOGIC AID TO AIR POLLUTION STUDY PERSPECTIVES

Toxicologic information should be utilized in setting air pollution study perspectives. The substances among the large number now known to be viewed as suspect in regard to chronic effects on health, may be brought into sharper focus through a consideration of their known toxicity. Because of the multitude of materials involved, only a few examples are offered to indicate how toxicologic information may be used.

Chronic toxicity or injury can manifest itself in two ways: (1) by a repetition of acute or subacute effects or (2) by an insidious, gradual development of chronic disease. The following are brief illustrations of the manner in which toxicologic information may be applied to shape air pollution perspectives.

Sulfur dioxide and related substances

have repeatedly been implicated in acute episodes, and much experimental evidence in animals [16, 17] show that a danger may be expected from short-term exposures. On the other hand, there has yet been no evidence and no physiologic reason to expect that injury may be caused by low-grade chronic exposures to sulfur oxides, such as currently exist in all large industrial cities (much less than 0.1 ppm). For example, above average tolerance to an appreciable concentration of sulfur dioxide is well recognized in workers around ore roasters.

Hydrogen fluoride and fluorine, like sulfur oxides, are irritant gases productive of acute injury, as shown from considerable experimental study.[18] Unlike sulfur oxides, however, fluorides are cumulative poisons producing irreversible skeletal changes after prolonged exposures; at higher exposures renal changes may develop. Currently, there are certain localized areas in the United States where long-term exposures to fluorine are creating a problem that should be given serious attention.

Hydrogen sulfide, although an exceptionally effective and highly toxic asphyxiant at elevated concentrations (0.07–0.1 per cent), because of its paralytic effect on respiratory nerve endings, would anticipatedly be a source of danger in isolated areas as in the Poza Rica incident. However, concentrations of hydrogen sulfide in all of the large industrial cities are exceptionally low. Should concentrations of this substance rise in the coming years, a hazard may be anticipated, possibly from accumulation of effects.

Nitrogen dioxide, like phosgene, is well known to produce edematous changes in the lung that can end fatally if exposure is to relatively high concentrations (10–20 ppm). It is not believed, however, that such concentrations would normally be attained, chiefly because of the reactivity of nitrogen dioxide with organic air constituents. This assumption is borne out by current surveys which show generally low air concentration. No chronic effects from nitrogen oxides are anticipated, primarily because there are no indications that such gases have cumulative action. Small amounts are readily metabolized.

Arsenic and arsine, on the basis of present information, would not be expected to produce acute injury in a community, except in circumscribed areas about plants. There have been frequent instances of serious exposures to arsine in and about metal processing plants, but there have been no reports of widespread acute injury from other arsenic compounds. Arsenic is a cumulative, chronic poison with a capacity to engender tolerance, certainly in the concentrations (0.4–0.14 μg As/m^3) found in most cities (London, Cincinnati). The fact that individuals may develop tolerance to arsenic may affect the speculation that arsenic from air sources is cancerigenic. Moreover, arsenic from other sources, such as cigarettes, exceeds the amount inhaled from city air.

Examples could profitably be extended. In all cases, however, it is the balance between the degree of exposure to a particular substance and the state of the physiologic function involved that determines the final outcome on health.

Prime Desiderata for Medical Study —Thus far, both from evidence based on a study of actual events and for theoretical reasons, the improbability has been pointed out of identifying any one particular agent in a generalized smog atmosphere. As the number and complexity of substances in the air continue to increase and the opportunity for interaction becomes greater, the probability of doing more than identifying compound types seems remote.*

* A partial but a slowly evolving solution is possible only from a study of "one industry" areas where relatively few (less than half dozen) pollutants exist in sufficient concentrations among sizable populations.

The question then to be considered is, what is the best method of studying effects on health in such a complex of constantly changing mixtures on urban populations that are in turn equally complex as to physiologic response?

Enumeration of the factors influencing the response of individuals to smog constituents shows at least 5 independent variables and at least 16 dependent variables excluding the variables in smog itself. Factors affecting response are (1) group susceptibility, (2) population density and movement, (3) habits of living, (4) climatic factors, and (5) topography. One can readily list many factors under each of these major headings that influence individual response. Most important of these from a health study standpoint are the effects of other agents of disease, bacterial and parasitic, as well as personal hygiene and nutritional factors.

Such a large number of variables would have to be reduced to an absolute minimum to assure a health study of any reasonable chance of success. Practically, this can be done by limiting the study to population groups that are homogeneous in respect to the most important variables of group susceptibility, racial constitution, population density, housing, and nutritional status. Similar care must likewise be taken in the selection of controls. Smog areas, their intensity and character, will have to be defined within narrower limits than is now the custom in most surveys; averaged data from large areas will be useless for the present purpose. As it would be obviously desirable to study several such "homogeneous" segments simultaneously so as to include all of the factors among the total population of a city, a vast number of sampling stations would have to be set up and a large volume of analyses and statistical work would be entailed; on the medical side, a large staff of well trained epidemiologists would be required. The population covered by such a study would be restricted because of limited knowledge at present. It is not really known whether or not the lives of urban dwellers are affected by smog. There is also room for speculation that physiologic adaptability may override potential insults to health. For this reason, some have suggested concentrating a health study on groups whose adaptability has been limited by some partial disability such as chronic heart or pulmonary disease.

Before answers can be found to these questions, engineering controls may have progressed to such a point as to remove the cause for alarm or at least to reduce air pollution to such an extent that it will no longer be a problem.

REFERENCES

1a. Mage, J., et Batta, G. Resultats de l'expertise judiciare sur la cause des accidentes survenue dans la vallee' de la Meuse pendants les brouillards de decembre 1930. *Chimie et Ind.* 27:961, 1932.

1b. ———. Le role de l'acide fluorhydrique dans la nocivite' du brouillard de la Meuse en 1930. *Ibid.* 30:787, 1933.

2. Schrenk, H. H., Heimann, H., Clayton, G. D., Gafafer, W. M., Wexler, H., *et al. Air Pollution in Donora, Pa. Pub. Health Bull., No. 306.* Washington, D. C.: Division of Industrial Hygiene, Public Health Service. 1949.

3. McCabe, L. C., and Clayton, G. D. Air Pollution by Hydrogen Sulfide in Poza Rica, Mexico. *Arch. Ind. Hyg. & Occup. Med.* 6:199, 1952.

4. Stokinger, H. E., Ashenburg, N. J., *et al.* Acute Inhalation Toxicity of Beryllium. II. The Enhancing Effect of Hydrogen Fluoride Vapor on Beryllium Sulfate Poisoning in Animals. *Ibid.* 1:398, 1950.

5. Adams, E. M., and Schneider, E. J. *Eye Irritants Formed by the Interaction of Styrene and Halogens in the Atmosphere.* Midland, Mich.: Biochemical Research Department, Dow Chemical Company. April, 1952.

6. Eisenbud, M., Wanta, R. C., Dustan, C., Steadman, L. T., Harris, W. B., and Wolf, B. S. Non-occupational Beryllosis. *J. Indust. Hyg. & Toxicol.* 31:282, 1949.

7. Keenan, R. G., and Byers, D. H. Rapid Analytic Method for Air-Pollution Surveys. *Arch. Ind. Hyg. & Occup. Med.* 6:226, 1952.

8. Stokinger, H. E., Steadman, L. T., Wilson, H. B., Sylvester, G. E., Dziuba, S., and La Belle, C. W. Lobar Deposition and Retention of Inhaled Insoluble Particulates. *Ibid.* 4:346, 1951.

9. Haagen-Smit, A. J. Chemistry and Physiology of Los Angeles Smog. *Ind. & Eng. Chem.* 44, 1:342, 1952.

10. Haagen-Smit, A. J., Darley, E. F., *et al.* Investigations on Injury to Plants from Air Pollution in the Los Angeles Area. *Plant Physiol.* 27: 18, 1952.

11. Dixon, M. Reactions of Lachrymators with Enzymes and Proteins. *Biochem. Soc. Symp.* No. 2, p. 39, 1948.
12. Tobias, C. A. Mechanisms of Biologic Effects of Penetrating Radiations. *Fed. Proc.* 10:595, 1941.
13. Chance, B. The State of Catalase in the Respiring Bacterial Cell. *Science* 116:202, 1952.
14. Waller, R. E. The Benzopyrene Content of Town Air. *Brit. J. Cancer* 6:8, 1952.
15. Magill, P., and Benoliel, R. W. Air Pollution in Los Angeles County. Contribution of Combustion Products. *Ind. & Eng. Chem.* 44, 1:347, 1952.
16. Treon, J. F., Dutra, F. R., Cappel, J., Signmon, J., and Younker, W. Toxicity of Sulfuric Acid Mist. *Arch. Ind. Hyg. & Occup. Med.* 2:716, 1950.
17. Amdur, M. O., Schulz, R. Z., Drinker, P. Toxicity of Sulfuric Acid Mist to Guinea Pigs. *Ibid.* 5:318, 1952.
18. Stokinger, H. E. The Inhalation Toxicity of Fluorine and Hydrogen Fluoride, in the Pharmacology and Toxicology of Uranium Compounds. (C. Voegtlin and H. C. Hodge, Editors.) New York: McGraw-Hill, 1949.
19. Cholak, J., Schafer, L. J., and Hoffer, R. F. Results of a Five-Year Investigation of Air Pollution in Cincinnati. *Arch. Ind. Hyg. & Occup. Med.* 6:314, 1952.

The Journal 25 Years Ago

SAFE WATER BY THE ROADSIDE

As the tourist season opens the following has some timely interest:

"Michigan began its annual roadside water survey earlier this year than usual so that tourists will be safeguarded against polluted and contaminated water and the safe water supplies will be posted before the tourist season is in full swing. Two men are sent out to collect samples of water which are sent to the state laboratory for analysis. A third man is sent out a couple of weeks later to post the supplies found safe upon analysis with a 'Safe Water' sign." (*A.J.P.H.* 18, 8:1002 (Aug.), 1928.)

As public health services take on broad new functions outside the fields of environmental sanitation and communicable disease control, hospitalization becomes increasingly of moment to public health administration. So the story of the evolution of payment plans for hospital care in a Canadian province may have something helpful to say to us on this side of the border.

The Saskatchewan Experience in Payment for Hospital Care*

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THE problem of payment for hospital care by an agency on behalf of the patient is receiving much thought everywhere. Our purpose here is to point out some of the technics which have been used in a compulsory province-wide hospital care insurance program—known as the Saskatchewan Hospital Services Plan—which has been in operation since January 1, 1947.

Since the basic facts about this program have been reported elsewhere,[1] a brief introductory statement must suffice. The plan is administered by the provincial Department of Public Health in consultation with representatives of the hospitals. Its purpose is to make essential hospital care available on a free choice basis and it covers about 94 per cent of the total population, or about 780,000 persons. The program is financed through obligatory personal premiums, except for the indigent, and through supplementary provincial taxation. The benefits include minimal or public ward accommodation and virtually the entire range of available inpatient services. Length of stay is governed only by medical necessity. The insurance plan is supplemented by many measures to promote care of high quality, such as training institutes and the availability of departmental specialists in such fields as nursing, laboratory and x-ray technology, dietetics, pharmacy, accounting, and hospital administration.

Under this program payment is made to 163 general hospitals and nursing homes within the province. Hospital care is also paid for in certain special institutions such as veterans' hospitals, Indian hospitals, and sanatoriums for cases admitted to them in emergency.

The basic philosophy governing pay-

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ments to Saskatchewan hospitals should be made clear at the outset. Briefly this assumes that:

1. In a universal coverage program the hospitals have the right to be reimbursed in such a way as to cover the cost of efficient operation.
2. The payment system should encourage hospitals to maintain the highest possible standards of care.
3. The hospitals as partners in a cooperative program should participate in payment policy deliberations.

Mention might also be made of two practices incorporated in the payment policy:

1. An allowance for depreciation is paid, including depreciation on donated assets.
2. Since most hospitals in the province are nonprofit organizations, any revenues, over and above those received from the insurance plan, are taken into account when calculating the rate of payment from the plan.

Three different methods of payment to hospitals have been used during the past six years. The evolution of these systems is felt to be of interest and forms the main subject matter of this paper.

POINT SYSTEM OF PAYMENT

In 1943 Dr. Harvey Agnew, of the Canadian Hospital Council, published a proposal that hospitals be paid on a point rating system based on the establishment of a schedule of points and the application of a mill rate to those points.[2] Based on this proposal, a schedule was developed during 1945 and 1946 by a committee representing the hospitals, the medical and nursing professions, and the government which was used in 1947 to determine the plan's rate of payment to general hospitals in Saskatchewan.

The maximum possible point score was set at 835, with a basic minimum of 350 points being allotted to all hospitals. The balance of the points were allotted to cover not only physical facilities and procedures available, but also took into account the qualifications of personnel.

The amount payable per patient day was determined by multiplying the total points by a mill rate. The rates finally agreed upon with the Hospital Association representatives were 6.5 mills for the first 10 days of a patient's stay, 6 mills for the second 10 days, and 5.5 mills for that portion of stay beyond 20 days. Therefore, if a hospital received 800 points, it would be paid at a rate of 800 x 6.5 mills, or $5.20 per day for the first 10 days of the patient's stay, $4.80 for the second 10 days, and $4.40 per day beyond 20 days. These rates were intended to cover all benefits provided under the plan. Rates for newborn infants were the same as for adult patients. It should be remembered that these rates were applicable in preinflationary days and that the cost of hospital operation in Saskatchewan is substantially lower than in the United States and elsewhere in Canada.

When this system of payment was introduced it was believed that one of its advantages would be the reimbursement of hospitals according to their ability to provide a complete service. A second point in its favor was that it would stimulate improvement in equipment and personnel, since each improvement would increase total points. Provision was made for the recalculation of allotted points throughout the year and all changes in point rating were made effective as from the first day of a calendar month. During the course of 1947, 103 hospitals increased their point allotments by an average of 30 points.

By the fall of 1947 it was evident that serious financial difficulties were being encountered by hospitals as a result of using the point system of payment, and, equally serious from the standpoint of public policy, many hospitals were making a profit. The point rating system was revealed as arbitrary,

failing to take into account legitimate differences in operating costs as between individual hospitals. The question faced was whether the insurance plan could consistently underpay certain hospitals and, on the other hand, use public funds to enable other hospitals to make consistent profits.

All hospitals were at this time advised that deficit adjustment would be made up to 80 per cent of their operating losses. Such payment would be made only if there was evidence that positive measures were being taken by hospital management to control costs and provide efficient and adequate service.

It can be seen that this step involved a departure from the principle of the point system and led in the direction of the next method of payment. It seemed that no feasible modification of the point system could overcome its shortcomings and the decision was therefore reached, after consultation with the hospitals, to change, in 1948, to a system of payment reflecting the cost of efficient operation in individual institutions.

INCLUSIVE PER DIEM RATES BASED ON ESTIMATED COSTS

In 1948, therefore, rates payable by the plan to public general hospitals in Saskatchewan were based on the estimated cost of efficient operation. It was felt that all hospitals of 15 or more beds would be able to submit budgets based on a standardized accounting system which was introduced in 1947. Because of rapid price increases taking place at that time, it was determined to apply the initial rates which were set to the first six months of the year, subject to review at the end of the first or second quarters. Budgets were not required from hospitals of less than 15 beds and their rates were established on the basis of actual operations in 1947 and a review of all the factors affecting cost. Rates were set by negotiation with hospitals through a Rate Board set up by the department. This board met with the management of every hospital that requested a meeting. In almost all cases rates were agreed to by mutual consent. Moreover, the joint meetings offered an excellent opportunity to plan improved services and more efficient operation.

It was understood and agreed that if operating deficits were incurred by hospitals no adjustment would be made in hospitals of 50 beds or more, 80 per cent of the operating deficit could be met in hospitals in the 15–49 bed groups, and 100 per cent of the deficit might be met in hospitals of less than 15 beds. The policy of varying rate payments according to the length of stay was continued. It was understood that with the agreement to pay small hospitals up to 100 per cent of their operating deficit, reasonable supervision of operation by the health department would be accepted.

The practice of paying for the care of newborn infants at the same rates as for adult patients was discontinued in 1948. Complaints from the public that exorbitant rates were being paid for newborn care were evident. A flat rate of $2 per day was established for the care of newborns in all hospitals. Readjustment of the rate for newborns, of course, resulted in revision of rates for adult patients.

With very few administrative difficulties this system was brought into effect in 1948 and continued into 1949. Because of the continued rapid rise of prices beyond amounts anticipated in hospital budgets it was seen that deficit adjustments would have to be continued in all hospitals. It also was made clear to the hospitals that rates could be renegotiated at any time.

During 1950 it became apparent that there were certain disadvantages inherent in the use of a method of payment for each day of service in a program which covers virtually the entire popula-

tion. This was true, regardless of whether such rates were determined by a point system or based on cost of operation. Hospitals' inpatient revenue fluctuated almost directly with seasonal variations in occupancy, thus creating some difficulty in financing fixed expenses during periods of low occupancy.

It also became apparent that there was a marked variation in the utilization of hospitals in some areas of the province and it was admitted that certain hospitals found payment on a patient-day basis an incentive to overcrowd because a drop in occupancy meant a corresponding decrease in revenue.

These problems were discussed in 1950 with representatives of the hospitals and agreement was reached on a modification which might help to solve these difficulties.

SEMIMONTHLY LUMP SUMS PLUS PER DIEM PAYMENTS

At the beginning of 1951 the plan began to pay lump sums to hospitals on a semimonthly basis. These semimonthly lump sums, which remained the same regardless of fluctuations in occupancy, were calculated to represent slightly more than the total of relatively fixed expenditures such as depreciation, power plant costs, and salaries. Payment was also made, on receipt of individual accounts from hospitals, at per diem rates estimated to represent slightly less than the amount of such variable expenses as food, laundry, and drugs which fluctuate almost directly with occupancy. The per diem rates (covering variable costs) were fixed by hospital size and are presently $2 for hospitals of 50 or more beds, $1.75 for the 15 to 49 bed group, and $1.50 for the less than 15 bed group.

The same type of budget used in previous years was prepared by all hospitals and the total anticipated operating cost of each hospital at an agreed average occupancy was determined. The greater part of this estimated annual cost was incorporated in the semimonthly lump sum payments. The remainder, at a per diem rate to cover variable expenses, was paid when discharge notifications and accounts were submitted.

There have been two marked effects of this system. Fluctuations in hospital income have been leveled out and hospital management has welcomed the receipt of known amounts of money twice monthly. It can also be seen that if hospital occupancy varies either above or below the level estimated in the budget, fluctuations in total income will be less than when payments were made entirely on a patient-day basis.

The second effect has been to reverse the financial incentives to hospital management in regard to occupancy. Since the lump sum payments represent slightly more than fixed expenses and the amounts paid at per diem rates represent slightly less than variable expenses, there will be a slight operating loss on each patient day over the budgeted figure. That this reversal of financial incentives has occurred there can be no doubt. In those hospitals where in 1950 the length of stay and the number of admissions were considerably greater than the provincial average, a leveling off has occurred to more reasonable rates. From any evidence available it would appear that this system has reached a high degree of acceptance by all the hospitals in the province and has, in addition, tended to stabilize the financing of the insurance plan.

It is now felt that the present method of payment is equitable and effective. Hospitals are pleased with it since it stabilizes their income and permits better budgetary control. Hospital plan officials are also pleased with it since it simplifies their budgetary problems and in addition removes any incentive there

may have been to overcrowd hospitals for the purpose of keeping institutional revenues bouyant. There will undoubtedly be minor changes effected in this method in the next few years, but it is felt that the evolutionary changes described here have led to a sound, workable, and equitable method of remuneration of hospitals for coverage under a comprehensive hospital care insurance program.

REFERENCES

1. Rosenfeld, L. S. Province-wide Hospitalization in Saskatchewan. *Pub. Affairs* 157-167 (June), 1947. Mott, F. D. Hospital Relations. *A.J.P.H.* 12:1539-1544, 1947.
   Taylor, M. G. *The Saskatchewan Hospital Services Plan.* Regina. Canada: Health Services Planning Commission, 1949.
   Annual Report of the Saskatchewan Hospital Services Plan, 1951.
2. Agnew, H. A Units of Credit System for the Payment of Hospitals. *Canad. Hosp.* (Nov.), 1943, p. 44. For a further discussion of the system, see the symposium in *Hosp.* (Jan.), 1944, and the reply by Dr. Agnew in the succeeding (Feb.) issue.

State Board of Health for Nebraska

The present session of the Nebraska Legislature passed a bill providing for a State Board of Health, thus reducing to two the states without a board or other state advisory health committee or council. The bill as passed calls for a seven-man board of health—two members of the State Medical Society, one member each of the State Dental and State Veterinary Medical Societies, one member of the American Society of Civil Engineering, and two other "public-spirited" citizens. The health officer is appointed by and serves at the pleasure of the board which fixes his compensation. The ceiling on the health officer's salary is set at $12,500, whereas the previous ceiling was $8,500.

The reader will find himself alert to identify all the factors that may have enabled this extensive program of medical, surgical, and hospital care to avoid so successfully the common sources of friction likely to develop in this difficult area of medical and public relationships.

United Mine Workers of America Welfare and Retirement Fund Medical Care Program*

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THE medical care program of the UMWA Welfare and Retirement Fund is extended to approximately one and one-half million potential beneficiaries consisting mostly of miners and the dependent members of their families. They are located in the mining areas of 24 states and the Territory of Alaska. The program has been in operation for thirty-two and one-half months as of July 1, 1952. The services provided are as follows:

1. Hospital care for such time as necessary.
2. Medical care in the hospitals.
3. Specialists' services outside the hospital as necessary.
4. Rehabilitation services under the management of physicians at special centers.
5. Drugs administered to hospital inpatients.
6. Certain expensive drugs requiring long continuing use outside the hospital.
7. Physical examinations in connection with applications for prescribed cash benefits.
8. Home and office care for severely handicapped patients following discharge from special rehabilitation centers.

The following services are not provided:

1. Available services which the patient may be entitled to receive from an agency of the government, such as treatment for tuberculosis or mental disease in a state or county hospital, or from a private organization in the case of tuberculosis, infantile paralysis, cancer, etc.
2. Services for which the employer or some other party is legally responsible, such as medical service in compensation cases, etc.
3. Long-term treatment for mental illness.
4. Tonsil and adenoid removal.
5. Dentistry.

An experiment in providing home and office care to a limited number of beneficiaries on a free-choice-of-physician fee-for-service basis was tried for about eight months. It was unsatisfactory in every respect and therefore discontinued.

During the 12-month period ending June 30, 1952, 2,154,882 days of hospital and medical care were provided for 215,372 beneficiaries. Expenditures for all medical care benefits amounted to $49,996,517.88. Of these benefits, 85.6 per cent were received by working or retired miners and their families; 4.1 per cent by widows and orphans of deceased miners, and 10.3 per cent by disabled beneficiaries.

Some 2,100 hospitals all told have

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cared for our patients, and some 8,000 physicians have received payment for services rendered.

Of the combined cost of hospital and physician services about two-thirds was for hospitals and one-third for physicians.

Responsibility for the development and operation of the medical program rests squarely in medical hands. This is a principle that the medical profession has always staunchly advocated and is quite the antithesis of much of the experience elsewhere. In other words, our medical program is as good or as bad as we doctors in the fund, our medical advisers, and the physicians who care for our patients succeed in making it. If our combined efforts are not successful in fulfilling our objective of providing a good quality of hospital and medical care at fair and just cost, we alone will be to blame.

The medical program is administered through 10 area offices, each responsible for the activities within a specified area. Together, they cover the coal mining regions. Each area office is in charge of a physician who is an experienced medical care administrator. He works under the general direction and supervision of the executive medical officer of the fund at the Washington headquarters office.

To insure maximum efficiency and economy in administration, exceptional care has been exercised in the selection of area office personnel. The medical administrators are generally recognized as outstanding in their field. All were occupying positions of large responsibility prior to joining the fund. Many possess the certificate of the American Board of Preventive Medicine and Public Health; the applications of others are pending.

An administrative officer in each area office assumes the responsibility of management and operation under general medical direction. All possess special qualifications as to professional education, training, and experience. Most have university degrees.

There is provision for a public health nurse on the staff of each area office. They are highly trained women with postgraduate education who have occupied positions such as director of public health nursing in a state department of health, nurse officer in the Commissioned Corps of the United States Public Health Service, territorial supervisor of a large national life insurance company, etc. Their duties are broad in scope with especial attention to the development of cooperative relationships with official and voluntary groups and organizations for the purpose of extending their services to the mining population.

All area officers employ one or two consultants in rehabilitation to follow up on the rehabilitation phases of the program. The balance of the personnel is engaged in lesser administrative duties and in clerical work.

The medical headquarters of the fund in Washington consists of the executive medical officer and two associate physicians, a dentist whose duty is to work with official health agencies toward the extension of public health dental services to mining areas, an administrative officer, a hospital consultant, and a rehabilitation consultant. The rest of the persons employed serve under the direction of the supervisors mentioned. There is a total of 28 persons in the medical headquarters office of the fund in Washington.

HOSPITAL SERVICES

The fund has neither owned nor operated hospitals up to the present time. Existing hospitals have been used according to convenience of location and their willingness and ability to provide a satisfactory quality of service on an acceptable cost basis.

Representatives of the area offices visit the hospitals from time to time and

arrange with them individually for services and terms. Only hospitals with which arrangements have been made may be used by beneficiaries at fund expense. Exception may be made in case of dire emergency. The bills are sent to the area offices for certification as to charges for services rendered. From there they are transmitted to the Washington office for review, auditing, and payment.

Beneficiaries are provided with identification forms acceptable to the hospitals and physicians who are authorized to care for them.

When a beneficiary is afflicted with an illness or injury of an exceptionally serious or baffling nature which cannot be adequately cared for locally, the area office may arrange for his care at the nearest medical facility that can provide the service that the case requires.

Not all of the local hospitals are satisfactory either as to service or to cost. Unsatisfactory services, however, may be preferable to none at all and may be purchased in the interest of the patient if nothing better is available. Even when the charges are exorbitant, they are paid if other means of caring for the patient are impracticable. The area offices have devoted much patience, time, and effort to improving the conditions of substandard hospitals as far as possible. They have at times been forced to adopt heroic measures against exploitation through poor service and exorbitant charges. Considerable numbers of patients have been transported by ambulance for distances of from 30 to more than 100 miles when occasion required. Such action constitutes a hardship and heavy expense to all concerned, but it has almost invariably resulted in improved conditions and fairer charges in the end.

HOSPITAL CONSTRUCTION

Certain mining areas, especially in Kentucky, Virginia, and West Virginia, have been woefully lacking in hospital and medical care throughout the history of the industry. Much of the service that the miner has received has been of inferior quality, although the money he has paid through the years has been sufficient to provide the best. The chances for improvement were found by the fund's medical staff to be nil in these communities because competent well qualified physicians sufficient to meet the needs could not be induced to practice in areas in which neither hospital nor other facilities were available. As there were no indications that the deplorable conditions of the past would not extend indefinitely into the future, the fund had no other recourse than to arrange for the establishment of new hospitals in some of the areas in which most desperate need existed. Therefore, there have been created the Memorial Hospital Association of Kentucky, the Memorial Hospital Association of Virginia, and the Memorial Hospital Association of West Virginia. These associations are nonprofit corporations organized in accordance with the laws of the respective states. They are responsible for constructing, equipping and operating new hospitals at or near Harlan, Pikeville, Hazard, Middlesboro, Whitesburg, and Wheelright in the State of Kentucky; at Wise in the State of Virginia, and at Beckley, Logan, and Williamson in the State of West Virginia.

Views as to the methods of staffing and operation that will insure the highest type of hospital and medical service possible under the conditions that exist, either have been or will be sought from physicians in the areas concerned, from their state and local medical societies, from the Medical Advisory Committee of the fund, and from other sources from which useful knowledge and experience are obtainable. Final decision as to the plans to be adopted will be reached only after thorough considera-

tion of all the data and experience that can be gathered.

Each Memorial Hospital Association consists of a Board of Directors composed of four employees of the UMWA Welfare and Retirement Fund. Legal and fiscal services are provided by the legal counsel and the comptroller of the fund. The membership of each of the three boards is the same. A medical administrator and a deputy medical administrator are appointed by the Board of Directors of each association. They are responsible to the Board of Directors for carrying out the duties which the board assigns. The medical administrator and the deputy medical administrator of each association are the same.

Money for the Memorial Hospital Projects is provided by the UMWA Welfare and Retirement Fund through loans made in accordance with agreements between the Board of Trustees and the Board of Directors of each hospital association. The Board of Trustees has delegated to the director of the fund and the executive medical officer the administrative responsibilities arising out of the provisions of the agreements, and likewise the responsibility of developing and maintaining close working relationships with those concerned with the hospital and medical care of fund beneficiaries in the mining areas.

While the primary purpose of the Memorial Hospitals is to provide good hospital care and facilities that would not otherwise be available to fund beneficiaries, they may also provide services to other members of the community to the extent that the services may not be needed by beneficiaries of the fund.

PHYSICIANS' SERVICES

Payments are made by the fund for the services of physicians as follows:

1. Medical care of beneficiaries during their period of hospitalization.
2. Diagnostic services of specialists to whom patients are referred by their attending physician.
3. Follow-up care in the home and office prescribed by physicians at the special rehabilitation centers for severely handicapped beneficiaries for such time as necessary after discharge from the center.
4. Physical examinations required in connection with applications for prescribed cash benefits from the fund.

Any physician may receive payment from the fund for services rendered its beneficiaries under the following conditions:

1. He must be in good professional repute.
2. He must indicate his desire or willingness to provide treatment to fund beneficiaries at a charge that is reasonable for the type of patients treated under the conditions that exist.
3. He must abide by the regulations of the fund in regard to the submission of clinical records and data required for payment of services rendered. These are kept to a minimum. No physician has been critical of the paper work required.

The large majority of physicians who care for our patients are able, conscientious men. They participate wholeheartedly in the medical program of the fund, and render the best service of which they are capable at rates which are acceptable both to them and to the fund.

We are studying a method of payment to physicians on a time basis which may be more satisfactory to all concerned. This may be conducive to a better quality of medical care, ease of administration, early referrals, and utilization of group practice.

Among the physicians who serve our patients are a number of the leading men of the country in the various specialties of medicine. They have assured us again and again that, busy though they are, they are eager to receive our patients because "they are such nice people, so appreciative of what is done for them, and often present such a challenge to all the ingenuity and skill that we possess." It is a heart-warming experience indeed when a miner who has

gone through untold agonies writes to the fund and says, "Doctor X is the finest man I ever saw" or "He took the time to explain and tell me what to do."

In the field of rehabilitation alone, thousands of crippled miners have been restored to usefulness and to re-employment. The arduous, costly task of restoring men with crushed limbs and backs in the terrible toll of the coal mines is one of the finest chapters in the history of medicine. The physicians and members of their staffs in their devoted and selfless treatment of these men are bringing new knowledge of inestimable value to medical science.

While we are deeply and sincerely appreciative of the cooperation of the majority of the physicians who have served our patients and the excellent service they have rendered at what we believe to be fair and just cost, there is another side of the picture which in fairness must be mentioned.

In a program as extensive as ours we have experienced also some of the most tragic practices and conditions that can be imagined. Some continue at the present time, although steps that I shall mention are on the way to curb them. There are physicians who, though licensed, are not competent to provide the quality of service that the present day requires. There are others who perform work which they know they are incapable of doing properly. There are still others who render needless and ill-advised services. There are some who are able to maintain a monopoly in medical practice in certain areas and whose charges are far in excess of those of equal competence elsewhere. There are those who are interested only in the maximum payments that can be extracted. There are those who will take advantage of an emergency situation to charge for surgery on a coal miner the amount that might be charged his wealthiest patient.

The physicians of the fund have done much to improve the standard of practice in many of the mining areas by bringing eminent consultants to remote coal mining areas where they see problem patients, review clinical records, suggest corrections, and in general improve the quality of local practice. They have provided incentive for better service by referring patients to medical centers. They have received assistance and cooperation from liaison committees in the state and local medical societies.

While it will no doubt be possible to continue to make improvements by various means that may be used, they will not be adequate, nor do we feel that the total responsibility should rightfully be placed upon us. We have, therefore, presented the facts to the appropriate bodies of the American Medical Association, which has evinced a keen interest and determination to gather further information and take such steps or actions as are necessary to improve the quality of medical and hospital care in coal mine areas.

Toward this end, a survey team was appointed by the American Medical Association to visit some of the areas and submit its findings and recommendations. This was followed by a conference in one of the mining areas initiated by the AMA. Invitations were issued to the presidents and other representatives of the five state medical societies concerned, to the health commissioners of those states, to representatives of the medical schools of the state universities, and to physicians of the UMWA Welfare and Retirement Fund. Some 70 of these persons were present at the conference which lasted two days.

Many recommendations were submitted for study and final action by the conference at a later meeting. Those approved will be presented for implementation by the various agencies concerned. The recommendations that are finally adopted and the manner in which they are carried out may have a strong

bearing upon the future course of our program.

I believe that the best conception of the medical care program of the UMWA Welfare and Retirement Fund, and the direction in which it is headed, is expressed in the words of John L. Lewis, the man who made it possible. In an address to the Forty-First Convention of the United Mine Workers Constitutional Convention held in October, he stated as follows:

> This plan of the United Mine Workers is not socialized medicine. This plan contemplates the purchase of the services of the medical profession and establishes the best possible service at a fair and just cost. That is free enterprise. That is not socialized medicine. And in this work, more and more as the days go by, the eminent figures in the American medical world are coming to understand more and more the value of this great arrangement in our industry and more and more are extending their cooperation and their helpfulness to make it the most successful of any plan in the country.

Training Courses in Diabetes Control

The Division of Chronic Disease and Tuberculosis of the U. S. Public Health Service has planned six training courses in diabetes control at the Diabetes Study and Training Center, Boston. The one week courses are designed for public health administrators, physicians, nurses, health educators, dietitians, nutritionists, medical technologists, and medical social workers. They will consist of discussions, demonstrations, and field trips, with opportunities for individual consultation.

The courses are:

1. A Diabetes Program in Public Health (September 21–25, 1953). Planned for all categories of public health workers involved in the planning and operation of diabetes public health programs.
2. Group Teaching of Patients (October 5–12 and November 30–December 4, 1953). Planned primarily for personnel concerned with organizing and conducting group classes for patients with diabetes and their families.
3. Nursing Aspects of a Public Health Diabetes Program
4. Nutritional Aspects of a Public Health Diabetes Program
5. Laboratory Aspects of a Public Health Diabetes Program
6. Organization and Management of a Diabetes Clinic

Dates of courses 3–6 will be announced later. Enrollment in each course is limited to 10. There is no registration or tuition fee. Applications must be received one month in advance of date of course. Further information and application forms from: Diabetes Study and Training Center, Public Health Service, 639 Huntington Avenue, Boston 15, Mass.

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FOGS AND SMOGS

IN presenting Dr. Stokinger's valuable contribution on air pollution studies, it seems important to call attention to the striking episode which occurred in London last December.

The tragic events which took place in the Meuse Valley in 1930 and in Donora, Pa., in 1948, killing 63 and 20 persons respectively, were associated with a high degree of industrial air pollution and with a terrain peculiarly adapted to the local accumulation of air contaminants. But the London incident of 1952 is not the first in which dense fog has caused a sudden increase in deaths in an area where pollution is not primarily of an industrial nature. At the end of 1873, London had an exceptionally severe fog and an even more lethal one early in 1880 when the ratios of deaths during the weeks of fog to the deaths recorded in the weeks immediately preceeding were 1.4 and 1.5, respectively. Then the death rate for the metropolis was 896 per million inhabitants, which when compared to a rate of 876 recorded for the worst week of the great London cholera epidemic in 1866, shows the disastrous nature of the phenomenon.[1] In 1892 and 1948 there were similar incidents in London, but there is reason to believe that during the five days of December 5–9, 1952, the fog in London caused deaths on a scale possibly never experienced before from this cause. A study of the deaths registered for the weeks ending December 6, December 13, and December 20 compared with the annual averages in corresponding weeks of the five previous years shows rather certainly that in Greater London approximately 4,000 deaths were brought about by the fog.

Although the increase in mortality was greater at older than at younger ages, it

was slightly less at ages 75 and over than at ages 45–75. The mortality of newborn infants almost doubled and that of infants 1–12 months more than doubled. Deaths of children 10–13 rose by a third; and of young adults by close to two-thirds. It is clear, therefore, that all ages shared to some extent in the increased mortality and that it was by no means confined to the very young or the very old. About half of the increase in deaths registered in the London administrative county for the week ended December 13 was attributed to bronchitis or pneumonia. Deaths from bronchitis increased by over eight times (from 76 to 704) and deaths from pneumonia by almost three times (45 to 168).[2] Other causes of death that increased greatly in this same week were respiratory tuberculosis, cancer of the lung, coronary disease, myocardial degeneration and "other respiratory diseases," including some influenza. The record states, though without humorous intent, that there was no increase in deaths from motor-vehicle accidents—"possibly because fewer vehicles were on the road"—and there was no increase in deaths by suicide!

Clearly, the problem of smog is not limited to industrial establishments in deep valleys between the hills; and the emphasis which many American students are placing on the study of this phenomenon is well warranted.

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1. *Brit. M. J.* 4805:321 (Feb. 7). 1953.
2. Logan, W. P. D. Mortality in the London Fog Incident, 1952. *Lancet* 1. 7:336, 1953.

THE INTEGRATION OF MENTAL HYGIENE AND SCHOOL HEALTH PROGRAMS

THE Baltimore County Mental Hygiene Clinic at Towson, Md., differs from most clinics of its kind in two respects—both of which are of direct interest to the public health worker.

In the first place, the clinic is operated under the auspices of the County Health Department; and in the second place, one of the principal sources of referral to the clinic is the public health nurse—who functions also as a school nurse. The administrative director of the clinic is a social worker with the title of mental hygienist who coordinates the services of the part-time psychiatrists and psychologists. Esta C. Maril, in a recent discussion of this program, notes the great advantage of the close integration which can be brought about in such an arrangement. Miss Maril serves as a consultant to the public health nurses. She points out that the public health nurse "has been fully incorporated as a member of the clinic team. In her everyday work she is constantly using mental-health principles which become more a part of her equipment as she works with the clinic team. Because her training and relationship in the community with all age groups has proven a valuable asset, she can prepare the patient for service. She can also provide the clinic with background information in the form of a social history. Since many of the families referred are already known to her, she has a wealth of accumulated facts, both medical and social, which are valuable to her other team mates. She is in a position constantly to interpret the service, and as her work becomes more integrated with the skills and techniques of the psychiatrically

trained members of the clinic team, she is able to impart her new knowledge and understanding to the people with whom she comes in contact on her own working level." Miss Maril cites a case history, the study of which we recommend to our readers.

A boy of 12 years came to the attention of the school nurse because of repeated headaches at school and because of his reluctance to submit to a recommended eye operation. Preliminary study revealed a deepseated inferiority complex complicated by the impact of a very severe and dogmatic father. It is a rule of the clinic that the patient must take the initiative in asking for an appointment. The mother, in this case, was persuaded to call the clinic and there began a series of conferences between the boy and the psychiatrist (whose interest was welcomed); and between the parents and the social worker in charge of the clinic; the public health nurse, who was also the school nurse, was always present as the intermediary. School authorities were enlisted in the solution of this boy's problems. Within a few months, not only was the eye operation willingly accepted and successfully performed, but the boy's personality improved substantially and his entire relationship to his family and his school was placed on a more understanding and a happier level.[1]

An equally inspiring example comes from a very different section of the continent. The health service of the Metropolitan District of Vancouver, B. C. (pop. 500,000), employs 95 nurses; its mental hygiene division has two psychiatrists, two psychologists, and one social worker. The health officer himself, it may be noted, has had psychiatric training. The activities of the social worker (male), first employed in 1950, are of special interest. He provides a certain amount of direct case work but functions mainly by intensive individual and group conferences with nurses, aimed at developing a full sense of the impact of emotional factors upon individual and family life. This work appears to have been remarkably successful; it is particularly encouraging to note that the influence has penetrated beyond the public health personnel and has actually aroused the interest of the classroom teachers in mental problems. The main task of the social worker, however, is to provide specific guidance to each nurse in her function as detector of emotional ills and dispenser of mental hygiene.

We need many more community mental hygiene clinics during the next few years. It is to be hoped that many will be organized on as sound and well integrated a basis as those which have been described here. The sponsor of the Vancouver enterprise points out [2] that "it is the function of public health departments to bring to the general public knowledge of mental hygiene; this is being recognized more and more widely both on this continent and internationally. The report of the first session of the Expert Committee on Mental Health of the World Health Organization includes the statement: 'The Committee, therefore, considers that the most important single-term principle for the future work of the WHO in the fostering of mental health is the encouragement of the *incorporation* (our emphasis) into public health work of the responsibility for promoting the mental as well as the physical health of the community.' "

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1. Maril, Esta C. The Mental Hygiene Clinic in an Organized Health Department. *Ment. Hyg.* 36:561 (Oct.), 1952. In the same issue on p. 639 please note a review of John Bowlby's monograph "Maternal Care and Mental Hygiene" prepared for the WHO.
2. Gundry, C. H., Hunter, Trenna G., and Itzkow, H. An In-Service Training Project in Mental Hygiene. *Ibid.* 37:47 (Jan.), 1953.

THE ROLE OF THE MOLECULAR FILTER MEMBRANE IN THE FIELD OF PUBLIC HEALTH

MANY problems involved in the physical, chemical, and microbiological studies of the human environment require the complete and rapid concentration of extremely small particles suspended in minute concentration within the two foremost environmental vehicles which come in contact with man continuously in large quantities—namely, air and water.

An important contribution in this field of laboratory technic has been made during the last five years by the development of the molecular filter membrane (see references 1–13). The filter membrane as described in the references cited is a rigid, wet-dry stable gel of uniform, controllable high porosity consisting of a combination of cellulose esters. Although the membrane looks like paper, it has no fibrous structure and no binding agent. The exact procedure of production is highly involved and unsuitable for the average laboratory. Details of the methods developed are still under military classification. Membranes of this type are, however, now available commercially and their application is unrestricted.

Although microporous membranes as such were known for many years and their occasional application to bacteriological water tests as a public health emergency measure was apparently first introduced in Germany during World War II, their real practical significance was only established in this country after Goetz and his collaborators at the California Institute of Technology learned to produce for the first time membranes equally stable in the dry and wet state, requiring thus no conditioning prior to use, and of a degree of uniformity and porosity which permitted rapid quantitative bacterial filtration. Also methods of subsequent nutrition of the bacteria on the membranes were developed at CIT and the Environmental Health Center which rendered reliable viable recovery possible. The same CIT group also developed the apparatus for the use of these methods in the laboratory and the field, as well as the basic principles and the engineering which realized industrial production of molecular filter membranes with standardized properties.

The basic significance of the possibilities which the MF technics offer from the standpoint of hygienic studies can be best summarized by a brief survey of their characteristic functional qualities.

1. The MF represents an extremely fine mesh screen with a large free area. Suspended matter is thus retained from water or air as an *accessible surface layer* at filtration rates which compare with those of the denser paper filters. It can be expected that present and future detailed work will succeed in developing simple analytical methods for the assay of the materials retained, as most of the physical and chemical properties of the MF screens are favorable to procedures such as surface photometry, electron and optical microscopy, microbalance determinations, etc.

2. The filter retains all bacterial organisms on the surface. With the transfer of the membrane to one or a sequence of nutrients there occurs rapid colony development, which is quite characteristic for different types. Special nutrient formulas have been developed or modified from existing formulas for the coli-aerogenes group and numerous other types such as Salmonellas, general water-borne bacterial flora, yeasts and fungi. Colony development is rapid, so that much earlier counts can be taken than on the normal plate or MPN method.

3. It is possible to concentrate microorganisms from very much larger quantities of water

than heretofore practicable—in fact, the sample is solely limited by the amount of suspended matter, which ultimately may clog the membrane. Under such conditions, the difficulty can be overcome by using membranes of larger sizes. This condition does not usually prevail in treated water supplies.

4. Colonies of most water-borne organisms of interest from the sanitary point of view develop rapidly on an MF into characteristic growth stages, where they can be counted after 10–16 hours of incubation, for instance on an Endo or EMB type of nutrient. Hence, cultures prepared in the late afternoon can be read and interpreted early next morning. This shortens the time required by present methods for information for presumptive and partly confirmatory tests to a half or a third.

5. After incubation, the membranes can be dried and kept indefinitely for record purposes without losing their characteristic appearance.

A survey of the economic angle has shown that the method is relatively expensive as far as the cost of the membranes themselves are concerned. The requirements for equipment and incubator space are reduced, it is true, but these savings may be only minor compared to the increased cost of the expendable membranes *unless* the increased test capacity of staff and facilities can be utilized. It can safely be estimated that, barring conditions of extremely turbid water supplies, the test potential can be increased from 10 to 20 times, with the same outlay for labor.

It is possible, however, that the use of the MF might eventually open the way to a more radical departure from our usual procedures which would involve large economies.

It has already been demonstrated that standardized, sterile assemblies can be prefabricated, consisting of membranes combined with pads containing a variety of dehydrated nutrient combinations (nutrient schedules) for specific end uses, claimed to have an indefinite storage life. This reduces the culturing procedure to filtration, rewetting of the pads, and subsequent incubation in preheated containers which do not even require a power supply. This procedure minimizes the requirement for presterilized glassware, etc., for each test to one or two items and thus brings a presumptive test almost into the category of a simple field test (like a pH or orthotolidine indication). It promises inexpensive means for a sanitary control routine in the small community, as it avoids the necessity for transporting water samples from outlying districts to central laboratories (avoids denaturation of the sample during transit) and may render unnecessary the establishment of expensive ambulant test laboratories for disasters like floods and epidemics. The subsequently dried membranes can, after initial inspection, be mailed for final interpretation to a distant laboratory base at almost no cost (since 200 dried membrane cultures weigh less than one ounce). It also offers opportunities for current sanitary control in the often neglected fields of food processing, bottling, in swimming pools, and many others.

The molecular filter membrane also opens up substantial possibilities in the study of atmospheric contaminants.[12, 13] If air samples are passed through the MF, the particles present can be counted as in a normal slide preparation for the microscope because the membranes can be made transparent after exposure to aerosols. There are also methods by which the membranes can be redissolved and cast in thin films with the retained particles so that they can be subjected to electron microscope methods of analysis. Integrating methods, i.e., over-all assays and estimates, can be obtained by surface photometry, as described by Goetz.[12]

The actual role of the MFM in water and air analysis remains for the future to determine; but there seems a great possibility that the device may open up far-reaching potentials in these fields.

1. Goetz, Alexander. *Materials, Techniques, and Testing Methods for the Sanitation (Bacterial Decontamination) of Small-Scale Water Supplies in the Field Used in Germany During and After the War.* Fiat Final Report 1312. Joint Intelligence Objective Agency. Washington, D. C.: Department of Commerce, 1947, p. 8 ff.
2. Goetz, Alexander, *et al.* Early Detection of Bacterial Growth. Final Report to Chemical Corps, U. S. Army, 1951.
3. Clark, H. F., Geldreich, E. E., Jeter, H. L., and Kabler, P. W. The Membrane Filter in Sanitary Bacteriology. *Pub. Health Rep.* 66:951, 1951.
4. Goetz, Alexander, and Tsuneishi, Noel. Application of Molecular Filter Membranes to the Bacteriological Analysis of Water. *J. A.W.W.A.* 43:943, 1951.
5. Clark, H. F., and Kabler, P. W. The Membrane Filter in Water Quality Tests. *A.J.P.H.* 42:385, 1952. Goetz, Alexander. Discussion. *Ibid.*, p. 389.
6. Kabler, P. W., and Clark, H. F. The Use of Differential Media With the Membrane Filter. *Ibid.* 42:390, 1952.
7. Goetz, Alexander, Gilman, R. H., and Rawn, A. M. Application of Molecular Filter Membranes to Specific Problems in Water Analyses. *J. A.W.W.A.* 44:471, 1952.
8. Goldberg, E. D., Baker, M., and Fox, D. L. Microfiltration in Oceanographic Research. I. Marine Sampling With the Molecular Filter. *J. Marine Research* XI:194, 1952.
9. Gordon, M. A., Ajello, L., Georg, L. K., and Zeidberg, L. D. Microsporum gypseum and Histoplasma capsulatum Spores in Soil and Water. *Science* 116:208, 1952.
10. Clark, H. F., Jeter, H. L., Geldreich, E. E., and Kabler, P. W. Domestic and European Molecular Filter Membranes. *J. A.W.W.A.* 44:1052, 1952.
11. Woodward, R. L. *Results of Statistical Analysis of Data Comparing Dilution Method and Membrane Filter Method for Estimating Coliform Densities in Various Waters.* EHC Activity Report No. 11, 1952, p. 13.
12. Goetz, Alexander. The Application of Molecular Filter Membranes to the Analysis of Aerosols. *A.J.P.H.* 43:150 (Feb.), 1953.
13. First, M. W., and Silverman, L. Air Sampling With Membrane Filters. *Arch. Ind. Hyg. & Occup. Med.* 7:1–11, 1953.

What Is Research?

"'Research' is a high-hat word that scares a lot of people. It needn't. It is rather simple. Essentially, it is nothing but a state of mind—a friendly, welcoming attitude toward change. Going out to look for a change instead of waiting for it to come. Research, for practical men, is an effort to do things better and not to be caught asleep at the switch. The research state of mind can apply to anything: personal affairs or any kind of business, big or little. It is the problem solving mind as contrasted with the let-well-enough-alone mind. It is the composer mind instead of the fiddler mind. It is the 'tomorrow' mind instead of the 'yesterday' mind."—CHARLES KETTERING

LETTER TO THE EDITOR

TO THE EDITOR:

As I am about to conclude 13 years of eventful service in the Governorship of Alaska, I feel it desirable to write to you that perhaps the greatest accomplishment during those years has been in the field of health. The progress there is almost wholly due to one man, the present Commissioner of Health, Dr. C. Earl Albrecht, who assumed his duties as the first full-time territorial commissioner 8 years ago.

The long-standing neglect of the federal authorities in respect to Alaska —who actually left us with no government at all for 17 years, and virtually no government for the first 45—was nowhere more flagrant than in the field of health. There were no hospitals, no clinics, almost no doctors, no therapy. Epidemics ravaged the land. Every unhealthful condition known to modern civilization existed in exacerbated form in Alaska. Before 1945 the only health organization in Alaska was headed by a practicing physician who under the law was permitted only to devote a part of his time to public health: this is an area one-fifth as large as the United States, and with the great variety of special climatic and ethnological factors which intensified the problem.

When the 1945 legislature convened I felt it essential that we move drastically into this long neglected field. The proposal was made to establish a full-time Department of Health, which could attack every aspect of ill health militantly.

We were extremely fortunate in finding for the commissionership a man who had come to Alaska 10 years previously as a medical missionary and had devoted himself to the care of the population in the Matanuska Valley. When war came in 1941 Dr. Albrecht promptly enlisted, was commissioned as a Captain in the Army Medical Corps, and at war's end was the Senior Base Surgeon at Fort Richardson, Army Headquarters, with the rank of Colonel.

Dr. Albrecht threw himself into this task not merely with missionary fervor but with a tremendous background of experience. It was necessary first to educate the legislators to give him the necessary legislation and to make the needed appropriations. Dr. Albrecht's unflagging zeal and persistence accomplished these near-miracles. In addition he was able to present the problem to Congress in such a way that it, too, took an active interest and participation.

After 8 years a monumental result has been achieved. The forces of disease and ill health are in retreat. But it is essential that we do not relax and that we continue to press forward under Dr. Albrecht's leadership with undiminished vigor and enthusiasm. It is my hope that you will be able to assist us in every way possible.

Alaska is not only a great outpost militarily and socially, but its destiny is to be in these far northern latitudes a shining example of the American way of life. It cannot be that, as long as the incidence of disease continues far higher than it should be in any civilized country. We must make sure that that victory, now in sight, is not only won but thereafter maintained.

ERNEST GRUENING
Governor of Alaska
Juneau, Alaska

April 9, 1953

Clearing House on Public Health Salary Information and Personnel Needs

RECRUITMENT IS IN THE AIR

Almost as if it were a concerted movement, recruitment programs have been intensified by a number of public health and related agencies. The recruitment programs of the national nursing agencies have been in high gear for several years and are continuing. The National Foundation for Infantile Paralysis, as expression of "its deep concern in the acute personnel shortages" in these three fields, has made substantial grants for recruitment of students to the American Association of Medical Social Workers, the American Occupational Therapy Association, and the American Physical Therapy Association.

The grants were made and the programs planned after surveys determined the extent of personnel needs and the educational facilities available. It was found that between 800 and 1,000 additional medical social workers annually were needed to fill present positions, to fill those in new and expanding programs, and to replace national losses. It was further found that school facilities were not being used to full capacity. The American Occupational Therapy Association estimates a 5-year need for nearly 7,300 newly trained physical therapists or nearly 1,500 annually. It believes that these could be trained without major increases in training facilities.

A brief survey of the recruitment programs of these agencies, together with that of the Council on Social Work Education, which is carrying on a grass roots recruitment campaign for social work students, follows:

American Association of Medical Social Workers—In the belief that an essential ingredient in a recruitment program is a full-time staff person to plan and give leadership to the project, this Association has a secretary for recruitment working under the leadership of a Committee on Recruitment, as well as cooperating with other agencies that are working in the social work recruitment field. The program is directed to junior and senior college students with the immediate purpose of securing medical social work students for fall 1953 enrollment up to the capacity of existing schools. Local units of the Association are setting up recruitment committees and working with the national project. Materials that have been prepared or are in preparation are:

1. An illustrated folder describing medical social work for junior and senior college students.
2. A radio platter dramatizing medical social work, "The Long Journey Home."
3. A film strip with narration by actor or actress showing a variety of settings in which social work is practiced.
4. Spot announcements for use on local radio stations.
5. Clip sheet for press distribution with feature stories.
6. A recruitment kit for use in districts and regions.

American Physical Therapy Association—This association also has a full-time staff member directing its accelerated recruitment program, the immediate goal of which is the enrollment of 1,000 students for the final year of specialization in 1953 and a long-range goal of continuing efforts to meet the demand. The chief purpose of the national pro-

gram is to supplement and give assistance to local chapter recruitment activities. Thus *Blueprint for Chapter Recruitment* has been prepared and distributed to chapters. It outlines resources, lists the agencies involved, the educational facilities available, suggested vocational guidance talks, and a timetable for the various activities.

Also released is a 17 minute sound film, "Within These Hands" designed to interest young people in a physical therapy career. "Physical Therapy: A Service and Career" is a recruitment brochure. A poster contest for a prize of $75 to the winning artist and $25 to the chapter that entered the winning poster brought 98 entries.

American Occupational Therapy Association—This association began a recruitment program in 1941, which was made more comprehensive in 1951 and has now been further broadened as a result of NFIP's grant. New materials prepared include a pamphlet each for recruitment, training, and service, audiovisual aids including a poster, exhibits, film strips and tape recordings; and distribution of materials such as outlines for career talks, career briefs, and literature listing. A workshop for state recruitment chairmen will be held at the annual meeting of the association in Houston, Tex., in November. The program is being geared to local participation. Each of the 46 state associations has a recruitment committee which energizes local recruitment services.

One recommendation made to state chairmen is to cover less competitive fields. Among them are junior high schools, more contact with parents, recruitment of men, more activity in small towns, and emphasis on person-to-person contact.

Each of the three organizations has a full-time staff member assigned to recruitment. They are respectively:

Elma Philippson, secretary for recruitment, American Association of Medical Social Workers, One University Place, New York 3

John D. Redjinski, chairman, Recruiting, American Occupational Therapy Association, 33 West 42nd St., New York 33

Marjorie Hyer, director, Recruitment Program, American Physical Therapy Association, 1790 Broadway, New York 19

Also related to recruitment in these areas is the program of the Council on Social Work Education which is recruiting social workers of all kinds including medical social workers. In cooperation with the National Committee on Social Work in Defense Mobilization it has made available a recruitment kit of materials and suggestions for grass roots use. Council on Social Work Education, One Park Avenue, New York 16, $1.00.

American Dietetic Association—has recently published two recruitment pieces for high school and college students respectively. *Chart Your Course Toward Dietetics* is a fact sheet telling what a dietitian and a nutritionist are, what they do, what high school work is related to further training, how to select a college, and how to find out about scholarship assistance. It has an attractive cover of a sailing ship starting its course around the globe. *A Dietetic Internship* explains what an internship is, what it means in future opportunities, as well as in security and training for home making. It ought to be very useful in helping a B.S. in nutrition decide the worthwhileness of a year's internship without pay. American Dietetic Association, 620 N. Michigan Ave., Chicago 11.

REVISION OF CONSUMER PRICE INDEX

With the assistance of technical advisory committees representing business, labor, the professions, and the government, the Bureau of Labor Statistics of the U. S. Department of Labor has revised its *Consumer Price Index*. Two

changes have been made, one in the base period, the other in the "market basket" of goods and services priced and in the list of cities in which prices are collected.

The second is of more long-run significance than the change in base period, which is purely a matter of arithmetical conversion. As directed by Congress in 1949, the bureau has recently completed its revision of the method of computing the index, which now includes 300 items instead of 225, as formerly. Precision has been increased by including price changes in such items as used cars, new homes, restaurant meals, and others not formerly in the "market basket" of goods and services.

Further, in order to make the *Index* more truly reflect prices paid by all urban wage and salaried clerical workers, a representative sample of small cities has been added. Price collection has been discontinued in some large cities formerly included in the sample.

The "market basket" itself is based on actual quantities of goods and services found by the bureau to be consumed by moderate income urban families in its Survey of Consumer Expenditures in 1950–1952. Because family incomes have risen faster than prices since the last similar study in 1934–1936, the proportion of family income spent for food, clothing, and shelter fell from 80 per cent in 1934–1936 to 72 per cent in 1952. Three per cent of this difference has gone into increased expenditures for transportation, five per cent for miscellaneous goods and services. After careful consideration, the bureau decided that income taxes do not properly belong in the structure of an index designed to measure the effect of price changes on the cost of living, although suggestions to include taxes had frequently been made.

Of special interest to public health workers is the weight of 4.7 per cent given to medical care in the revised "market basket." Eighteen items are priced to follow changes in costs of medical care—8 professional service items; 6 drugs and prescriptions; and 4 hospital services.

In the *Consumer Price Index* the base period representing 100 has been converted from 1935–1939 to 1947–1949 as of January, 1953. Thus, 100 on the new base equals 167.2 on the old base. Conversely, 100 on the old base equals 59.8 on the new base. The February, 1953, price index is 113.4 on the new base, namely 13.4 per cent above the average of 1947–1949 prices; 189.6 on the old base, namely 89.6 per cent above the 1935–1939 average.

Actually the *Index* goes back to 1913. For that year, on 1947–1949 base, the index was 42.3. The per cent change in prices between any two periods is the same no matter what base period is used. Only the number of index points representing a given per cent change in prices varies as the base is changed.

A brief and simple explanation of the *Index* will be found in *The Consumer Price Index—A Short Description of the Index as Revised,* January, 1953, Bureau of Labor Statistics, U. S. Department of Labor, Washington, D. C.

1953 ENGINEER GRADUATE OUTLOOK

In a quick check of prospects for its 1953 graduates, the Illinois Institute of Technology at Chicago found that engineers just out of school were being offered about 9 per cent more in February, 1953, than in June, 1952. By June, 1953, prospects are that average monthly salaries offered will have risen a full 10 per cent over a year ago.

The reasons for the rising salaries are to be found in the decreasing number of engineering graduates, discussed in the same issue of *Engineering News-Record* (Feb. 26, 1953). A survey of the Engineers Joint Council indicates that against an estimated demand for 30,000 young engineers, only about 17,200 will

be available for private employment after nearly 7,000 of the 1953 graduating classes go directly into the armed services. In projecting figures forward into the future, the Engineers Council believes that the 30,000 engineers graduated in 1952 will not be equalled again until 1956 (see also *A.J.P.H.*, Feb., 1953, p. 219).

Says the *Engineering News-Record* further, "State and municipal agencies are finding it increasingly difficult to fill their needs—engineering jobs in the state highway departments have been going begging, as in North Carolina where a $200,000,000 state highway program reportedly is bogging down for lack of engineering personnel."

PUBLIC HEALTH NURSE TRAINING

The National League for Nursing's new *Educational Programs for the Preparation of Public Health Nurses* replaces the earlier lists of programs that are approved for the training of public health nurses. It includes a total of 44 universities and colleges offering such programs; 30 offering educational programs for graduate nurses leading to a degree; 7 offering a collegiate basic program leading to a degree which prepares students for professional practice in both public health and other fields of nursing, and 7 offering both types of programs.

National League for Nursing, 2 Park Avenue, New York 16; 5¢.

WESTERN STATES COOPERATIVE PLAN

A Senate Bill, S. 1515, has been introduced by Senator Hunt of Wyoming and 11 of his western colleagues providing for the creation of the Western Interstate Commission for Higher Education. The plan for interstate cooperation is based upon the fact that several of the states have neither the financial resources to maintain nor a large enough population to supply an adequate student body for the various types of professional schools. Thus, state legislatures would provide funds for training states' students in existing schools in the area.

The commission is to be made up of three resident members from each compacting state, with staggered four-year terms. One member from each state must be an educator engaged in higher education. The bill specifically outlines priorities thus: "The Commission shall first endeavor to provide adequate services and facilities in the fields of dentistry, medicine, public health, and veterinary medicine."

The bill provides that the commission shall go into effect whenever five or more of the following states or territories have adopted the compact: Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Alaska, and Hawaii.

SOUTHERN REGIONAL EDUCATION BOARD

The Southern Regional Education program was initiated in 1948 with an agreement among 14 southern states to cooperate in improving the quality and variety of graduate, professional, and technical research and education in order to hasten the social and economic development of the South. Four regional contract programs are now in operation in medicine, veterinary medicine, dentistry, and social work.

Spotlight on the South's Regional Education Programs summarizes the experience up to date. Evidence indicates that the states have been able to improve the quality of their education programs at a saving over what the same programs would have cost if set up separately by the several states, that more graduates are practicing in their home states, and that the schools have been able to improve their programs. The Southern Regional Education Board, 830 W. Peachtree St., N. W., Atlanta 3, Ga.

MICHIGAN MUNICIPAL SALARIES

Salary and Wage Data, 1953 has recently been published as tenth in a continuing series of compilations of Michigan municipal salaries and wages by the Michigan Municipal League. Included are 15 positions in the health series, as well as data on hours of work and overtime and holiday pay practices. The study is particularly useful for general purposes in that salaries are shown separately for municipalities in five population-size groups. The study, however, has a more limited usefulness in the health field because it deals only with municipalities. Except in a few large cities public health activities in Michigan, as in a majority of the other states, are carried on by county health departments. Information Bulletin No. 68, Michigan Municipal League, 205 S. State St., Ann Arbor; $3.50.

ORIENTING THE EMPLOYEE TO THE JOB

This Is Your Job is described as "an easy-to-read guide to institutional service" rather than "a book of rules and regulations." In an attractive 33-page pamphlet, the New York State Department of Mental Hygiene attempts "to orient the employee to the functions of the institution, the important role he will play, and what is expected of him" as a "member of a team" of 28,000 persons. It is written and illustrated in an easy, informal style that sets the stage for easy relationships.

In a foreword the Commissioner of Mental Hygiene, Newton Bigelow, M.D., says what many another employer might say to his employees through a similar manual, "If you're new, there are probably many things about working in a mental institution that are strange to you and difficult to understand. Even if you're an old hand at it, there may still be some things you'd like explained. In this booklet are the answers to the major questions."

New York State Department of Mental Hygiene, Albany.

THIS EMPLOYEE WAS NOT ORIENTED

Introducing the new employee to his job and giving him some idea of "what it is all about" and what kind of a team he belongs to, is supposed to be an indispensable ingredient of bringing out his best potentialities. That this is sometimes overlooked is indicated by a letter recently coming to the information service of the American Public Health Association. How many such bewildered new employees are there who do not cry out to somebody for help?

"As this is my first position as secretary in a health department, and all routine and terminology is foreign to me, would it be possible for you to recommend material that would be helpful. I could obtain any material recommended from the State Library, if I had any idea of the type of material to ask for; or perhaps you could refer me to some other source where I might obtain this information."

Credit Lines

The Journal cannot furnish copies of items mentioned in Credit Lines. Please send requests to the addresses given.

CONFIDENTIALITY OF RELIEF RECORDS

In 1952 the Inter-Association Committee on Health adopted and published a statement on "Confidentiality of Public Welfare Records" in which it was recommended that "information involving health services, diagnostic information, or data by which diagnosis is made or treatment . . . that is contained in social case records and public assistance, be maintained in confidential or privileged status in order that the rights of the patient be protected and the full cooperation of the health professions assured." (*A.J.P.H.* 42, 3:337 (Mar.), 1952).

Now the General Board of the National Council of Churches, through its Department of Social Welfare, has demanded the repeal of the Jenner Amendment to the federal Public Assistance Law which allows states to publicize names, addresses, and amounts of assistance given to recipients. To support this demand it has issued *A Statement on Confidentiality of Assistance Records* which outlines fully the philosophy that demands confidentiality of the complete assistance record. Its six arguments against the general release of information about recipients and amounts of assistance grants are that it is:

1. Discriminatory.
2. Wrong in principle.
3. Ineffective in attaining the ends desired.
4. Involves potentially serious administrative difficulties.
5. Defeats one of the chief aims of constructive social service.
6. There are other and better methods for dealing with any present fraud or deficiency in the administration of relief.

The statement is a valuable document for health workers in meeting their responsibilities both as citizens and guardians of the community's health including its mental health. Department of Social Welfare, National Council of Churches, 297 Fourth Avenue, New York 10.

MORE HOSPITAL CARE COSTS LESS

It's Your Hospital and Your Life, by Lucy Freeman, is Public Affairs Pamphlet 187. In picturing just what happens in a hospital day by day, it does "a great deal to interpret the need for, the function and the place of the hospital in community life," according to the foreword of Dr. Anthony J. J. Rourke, president of the American Hospital Association.

The author's belief that the cost of a hospital stay to a patient today is actually less than it was in 1888, for example, should stimulate some rethinking and perhaps more cheerful acceptance of today's $10 to $20 per diem costs. The new skills and drugs of today have so shortened the average length of stay, Miss Freeman argues, that the increased per diem cost is more than compensated by the shortened hospital stay and the consequent decrease in wage loss because of illness. Public Affairs Pamphlets, 22 E. 38th St., New York 16, 25¢. Reduction on quantity orders.

INTERACTION OF HEALTH AND WELFARE

The recent study, *Future Citizens All*, by Gordon W. Blackwell and Raymond F. Gould, sponsored and published by the American Public Welfare Associa-

tion, should be of interest and concern to all health departments. Summarized in the *Social Security Bulletin* of January, 1953, this study is a report on Aid to Dependent Children. The status of the children and their families who received Aid to Dependent Children was studied in regard to the period leading to dependency, the period of dependency, and the period immediately following assistance. An analysis of the health status and health services received by the dependent children, revealed a generally poor level of health care, including a regrettable lack of public health services received. Here is a practical and feasible goal for official health and welfare agency cooperation in realizing the objectives of the recent statement "Tax-Supported Medical Care for the Needy" (*A.J.P.H.* 42:1310–1327 (Oct.), 1952); 25¢.

Future Citizens All will be useful as a basis for establishing health and welfare agency cooperation to help families receiving Aid to Dependent Children become aware of the public health services that are available to them and to encourage the active use of such services.

PAYING FOR SOCIAL SECURITY

In view of the close relationships between public health programs and the general programs for social security, public health workers will be interested in the recent publication, *Social Security Financing*. This interesting and lucid document summarizes the financing and financial problems of the Social Security program and provides a socio-historical background. It discusses the philosophy of social insurance in the American setting. A useful history is given of the grants-in-aid program which has been of major significance in public health financing. The effectiveness of the various technics of financing as well as the impact on the national economy are discussed with understanding and clarity. Some attention is given to the implications for the future in social and economic terms. A useful bibliography as well as tables of expenditures are appended. The author of the report is Ida C. Merriam, Bureau Report No. 17. Government Printing Office, Washington 25, D. C.; $1.

NUTRITION EDUCATION FOR HEALTH

The Department of Nutrition of the Harvard University School of Public Health has brought together in a monograph a description of several nutrition studies it has carried out. It is hoped that *Nutrition Education in Elementary and Secondary Schools* "will guide and encourage school administrators, teachers, and parents to examine more critically current practice in nutrition education and to plan better educational programs for school children."

The studies summarized are a series in Newton, Mass.; Rutherford County, Tenn.; Ascension Parish, La.; and in two Chicago public schools. The monograph includes a plan for a school program in nutrition education.

Grants-in-aid made possible the studies and the monograph. Grants were made by National Biscuit Company, National Dairy Council, General Mills, Swift and Company, and the Nutrition Foundation, from which the monograph is available. Chrysler Building, New York 17; $1.

PORTLAND LOOKS AT ITSELF

Portland, Me., has published a forthright report of a self-survey made by the Health Division of the Council of Social Agencies. The *Evaluation Schedule* of the American Public Health Association was used as a nucleus by six citizen committees. During the course of the study an engineer was added to the staff of the health department, and its budget increased by 37 per cent. Progress has been made in mental and family health. Efforts for a combination nursing agency are still pending.

THE ANNUAL REPORT IN THE NEWSPAPER

Two recent examples are at hand of health department annual reports appearing as sections of the community newspaper. The more extensive of the two is found in the *Wichita* (Kansas) *Sunday Eagle* which devoted an entire 12-page section of its January 18 issue to reporting on and praising the Wichita-Sedgwick County Health Department. With such major headlines as "Health Program Guards from Birth to Death," "Public Health Nurses Cover Wide Field," and "Health Service Merger Seen as Model," with photographs, and with newspaper style of writing, the *Eagle* again brings the health department into the lives of its readers, as it has done annually for the past several years.

The second example is the "Middletown's Progress' section of the March 8 *Middletown* (Ohio) *Sunday News-Journal* which reports on all city activities in 1951–1952. A large section is devoted to the health department and includes a summary of conditions as they existed in the 1880s when Middletown had its first board of health. Then "diphtheria raged through the city" . . . "the Board of Health fought for sewers to replace privies and appointment of a city garbage collector to clean up an appalling lack of sanitation." Yet to come in 1952 are:

Municipal garbage collection for the entire city.
A school dental health program.
Fluoridation of the water supply.
Annual chest x-ray for everyone 15 years of age and up.
Diabetes screening project.

ORTHOPEDIC HOSPITAL CARE STANDARDS

A unique set of standards? Hopefully not, but all evidence points to the conclusion that *Standards Recommended for the Hospital Care of Children with Orthopedic Handicaps*, developed by the Bureau for Handicapped Children of the New York City Department of Health, is the most complete statement of its kind at present. Prepared in 1952 with the assistance of two advisory groups, these standards were formulated chiefly as guides for hospitals wishing approval for payment under state aid programs. However, in these 11 pages are outlined many informative, realistic, and desirable standards which any hospital caring for children with orthopedic handicaps will find useful. Copies are available at the Bureau for Handicapped Children, New York City Department of Health, 125 Worth Street, New York 13, N. Y.

PICTURING POINT 4 IN LATIN AMERICA

The Institute of Inter-American Affairs has made available a series of reprints from various magazines that together tell the story of this joint enterprise of the various American governments for health and sanitation, food supply, and education. Although older than the Point Four program, the cooperative activities are good illustrations of "Point 4 in Action."

Among the 14 reprints are two that give the background and history of the cooperative "servicios" setup—"The Servicio in Theory and Practice" and "10 Years of Point 4 in Action in Latin America," reprinted respectively from *Public Administration Review* and *Export Trade and Shipper*. Other titles with particular relevance for public health are:

Program of the Rio Doce Valley—*Presenca*, Brazilian Magazine
When Good Neighbors Get Together—*Nation's Business Magazine*
Miracle on the Amazon—*Collier's*
The Point Four Program and Nursing in Panama—*Revista de la Cruz Roja Panamena*
Dust in the Lungs

Each of the 14 reprints is available without charge from The Institute of Inter-American Affairs, Inter-American Regional Office, 333 Third St., N. W., Washington 25, D. C.

A SOUTHERN PUBLIC HEALTH INSTITUTE

Early in 1952 a "first" Institute of Public Health was held at the Veterans Administration Hospital of Tuskegee, Ala. Presented by the Dental Service of the hospital in cooperation with local and state organizations, the U. S. Public Health Service, and the Agricultural Extension Service, the registration totaled about 2,000. For three days panels discussed community needs in terms of public health education and service and the contributions respectively of the Veterans Administration and Tuskegee Institute to the public health of Tuskegee and Macon County.

The proceedings, edited by the chairman of the Program Committee and chief of the Dental Service of the Tuskegee VA Hospital, Clifton O. Dummett, D.D.S., have become available. He described the goal "to make good personal and community health programs an accepted part of a way of life and culture of people."

MAKING FACILITIES KNOWN

The Wisconsin Heart Association has published *Physician's Guide to Wisconsin Cardiac Services*. The *Guide* was compiled to insure more complete utilization of state and community resources for heart patients. It had been found that many health and welfare workers were not aware of the services available. The booklet has been distributed to nearly 3,000 physicians, 200 public health nurses, and more than 100 health and welfare agencies in the state. As to availability of the *Guide*, the word is that, "We will be happy to supply single copies to another organization which feels that need for this type of publication and would like to use it as a reference." Grant Larned is the executive director, 642 N. 5th St., Milwaukee 3.

PREPARING FOR THE NEW POLIO SEASON

Polio Message to Parents, subtitled "Gamma Globulin—1953" is perhaps the most important of numerous new materials of the National Foundation for Infantile Paralysis designed to cut the hazards of whatever degree of polio incidence is ahead for 1953. It alerts parents as to the short supply of gamma globulin and the absence of polio vaccine for general use, together with the four basic rules for protecting children during the polio season. These rules are: *During epidemic period do not mix with new groups; do not get overtired; do not get chilled; but do keep clean.* The pamphlet is being distributed in schools of the country and is available elsewhere. NFIP says "Any number you wish to order can be sent about June 1."

Among other new materials are a *What to Do About Polio* for physical educators, recreation directors, and coaches; *Polio in Relation to Camping* for camp directors.

"1953 Polio Facts" is a series of advertisements to be used in buses, trains, and other public places stressing gamma globulin is not a cure, is in short supply, and again urging that the four rules are the best way to avoid polio. Also available are two exhibits, "Science Is Gaining Fast" (this weighs more than a quarter of a ton and requires a 10-foot space) and "Gamma Globulin," a small exhibit. And finally there is a list of *Publications, Films, and Exhibits.* National Foundation for Infantile Paralysis, 120 Broadway, New York 5, N. Y.

ANNUAL REPORTS

Forward With Your National Health Council is the 1952 and thirty-third annual report of the National Health Council. The fact that the membership of the council has doubled in five years leads to the sobering thought that its responsibilities have thereby been sharpened as well as its opportunities expanded to help the nation's complex health machine function effectively. Among the new activities reported as

approved for development by the council's Board of Directors as funds permit are greater coordination of national effort in recruitment and training of health personnel, more effective coordination of the health education activities of member organizations, and the publication of a periodic cumulative index to health literature. Thomas D. Dublin, M.D., is executive director of the council. Robin C. Buerki, M.D., director of Henry Ford Hospital in Detroit, is the newly elected president. 1790 Broadway, New York 19, N. Y.

Phoenix Reports is the report of two and one-half years of progress for the period ending in mid-1952 of what is reported to be "the 5th fastest growing city" of 100,000 population or more in the United States. Phoenix increased its population from 65,000 in 1940 to 122,000 in 1952.

During most of the two and one-half years represented by the report, the city had a full-time qualified health officer. James M. Dolce, M.D., was appointed on August 1, 1950, the city's first full-time health officer. The department was reorganized and staff members added "who were able to give services that had received little attention in the years past."

The report is an excellent example of an interesting and readable report of city activities to the citizens who pay the bills. Perhaps it is significant that it has a city manager form of government.

WORTH ACQUIRING

Cancer Control: A Manual for Public Health Officers has been prepared jointly by the National Cancer Institute of the Public Health Service and the New York State Department of Health. It is intended to help the health officer and others who can help in planning and carrying out an effective community cancer control program. The essential parts of a well rounded program, according to the text are: professional education, public education, case reporting and records, prevention, case finding, and cancer diagnostic and care services. The manual warns that "the most pressing need is to start an active program, not all of the gaps revealed by planning need be filled at once."

The *Manual* includes an extensive bibliography for each section, appendices that include a list of national organizations with a special interest in cancer control, the minimum standards for cancer detection centers as prepared by the American College of Surgeons, a listing of the role of various agencies in a cancer control program. The *Manual* does not tell how "Your Home Town" should organize a cancer program but it gives all the background information on which the planning can be based. Further, it is a handsome example of the printing art.

Free to New York State citizens and agencies from Office of Public Health Education, New York State Department of Health, Albany 6. Residents of other states, Cancer Control Branch, National Cancer Institute, Bethesda 14, Md.

Feeding Little Folks has been prepared by the National Dairy Council for mothers of children from one to five years of age. Written in an easy conversational style, it covers what to expect in small children, what foods are suitable for them, and how to bring children and food together happily. The emphasis is on individuality—letting the child develop a natural enjoyment of food. Free from National Dairy Council, 111 N. Canal St., Chicago 6.

BOOKS AND REPORTS

All reviews are prepared on invitation. Unsolicited reviews cannot be accepted.

Textbook of Preventive Medicine —*By Hugh R. Leavell and E. Gurney Clark. New York: McGraw-Hill,* 1953. 629 pp. Price, $8.00.

This latest 600-page volume approaches us with the idea of the natural history of disease or epidemiology as the educational thread to weave a new texture to tempt the medical student's interest and loyal concern. We are told there are four purposes in the minds of the two principal authors and their 19 collaborators, "to expand the concept of medicine for wider application, to give an understanding of the essentials of promoting health and preventing disease, to point out the value of practicing medicine with a preventive view point and motivate practitioners to incorporate this conception in their practice, to develop this philosophy and point of view that in health matters the role of private practice while essential is only one of many."

One asks then why the chapter on biostatistics with its essential discipline as a basis for approaching epidemiology is the last 24 pages of the book instead of the first.

The first three chapters of 64 pages are quite introductory and definatory of the ideas of the authors, a general approach and plan.

Chapters 4–8 (161 pages), dealing with the bulk of the traditional subject matter of preventive medicine, follow in the main the line of thought and description to be expected, with no novelties of fact or content or emphasis. Any rigorous application of epidemiological evidence to disclose substantial preventive results of the measures recommended as in the fields of cancer, allergy, diabetes and long-term illnesses in general, is lacking. From chapter 9, which presents factors of heredity as they may be seen by the practicing physician, through chapter 15 where the familiar plea for rehabilitation is briefly given, there seems to be an increasing dilution or omission of the original emphasis on epidemiology until the text resembles that of many predecessor books on preventive medicine. Maternity and child health, mental and occupational health, the promotion of screening for mass diagnosis, and a sort of review of the opportunities of the practicing physician are dealt with in these 171 pages.

There follows a sort of summarized or pint-sized encyclopedia or reference dictionary of the whole field of today's social, economic, administrative, and medical concern with medical care and public health, almost up to date and useful for the general reader curious to know what this public health and "social medicine" is all about and where government, society, i.e., the community, and the doctor play their appropriate parts.

The references gathered at the ends of the chapters are well chosen and, especially in chapters 16 and 17, perhaps too comprehensive, with 113, a full-time opportunity for a year or so of spare reading time for a medical student, or for a very long library reference shelf.

The index of 30 pages is abundant. One misses any serious approach to the prevention or community management of alcoholism, now so rapidly spreading a concern as one of the foremost, yes, and oldest of the neglected fields of preventive medicine.

This textbook makes rather more of the intent to emphasize epidemiology than the reader will find in the performance. The volume is formidable in the number of topics it calls to the medical student's attention. The arrangement and manner of presentation will have to be tested by use before assurance can be given that here is a new key to open doors of student minds to a mecca of preventive medical practice. HAVEN EMERSON

Introductory Mycology—*By Constantine John Alexopoulous. New York: Wiley,* 1952. 482 pp. Price, $7.00.

There has been a need of long standing for an elementary text in mycology particularly designed to provide workers in allied fields with information about the fungi. Such individuals will find this book a source of fundamental facts about the structure and classification of the fungi. It is broad in scope and general in its treatment of the subject and contains excellent illustrative material, which will be of considerable aid in orienting newcomers to the field.

Those workers who find themselves confronted either infrequently or for the first time with problems in medical mycology will find Chapters I and XIII of particular interest. Chapter I contains well organized and illustrated "background" information about the fungi in regard to their general characteristics, including morphology, reproduction, and classification.

Chapter XIII deals specifically with the Fungi Imperfecti, or Deuteromycetes, in which group the greater number of human pathogens are classed. It is regrettable, in view of the increasing need for information about the human pathogens in fields allied with medical mycology, that the coverage of material presented in this chapter is not more extensive. However, the author does not represent his work as either a complete treatise on the fungi, nor does he intend it to be used as a reference. Rather, it is intended to answer simply and concisely the question "What are the fungi and how do they affect us?" The material is oriented to this focus and, in the opinion of this writer, succeeds in its purpose. RUTH C. BURKE

Personality in the Making—*Edited by Helen Leland Witmer and Ruth Kotinsky. New York: Harper,* 1952. 446 pp. Price, $4.50.

This is the official report of the Mid-century White House Conference on Children and Youth which took as its theme "for every child—a fair chance for a healthy personality." This book is unquestionably the best summary of our present knowledge of personality development and should not only be read but studied by all professional persons who work with or in behalf of children.

The book is the product of many minds from diverse fields of education, health, law, anthropology, psychology, religion, and social work. It is remarkable for its uniformity in style, integration and balance, despite the large number of collaborators.

Part I presents the basic principles of healthy personality development; whereas Part II gives detailed consideration to their application in the conduct of the important social institutions and services, such as family, church, school, health, social and leisure time services, and services of law enforcement agencies. It is packed with facts and opinions of hundreds of experts in all fields of endeavor affecting the healthy development of personality in childhood and youth and should be at the very top of the reading list of all public health workers and students.

GOLDIE B. CORNELIUSON

Use of Antibiotics in Tropical Diseases—*By H. W. Brown, et al. Annals of the New York Academy of Sciences. Vol. 55, Article 6. New*

York: New York Academy of Sciences, 1952. 318 pp. Price, $4.00.

Dr. Harold W. Brown of Columbia points out in the introduction that the notable advances which have been made in the chemotherapy of tropical diseases for the past two decades demand that these data scattered across the world should be brought together, digested, and evaluated. A conference of the New York Academy of Sciences was organized with the participation of 50 persons.

The reviewer is not aware of any single source of such a comprehensive nature as this. Included are studies of antibiotics in scrub typhus, endemic and epidemic typhus, Q fever, rickettsial pox, Rocky Mountain spotted fever, typhoid fever, tropical ophthalmias, cholera, shigellosis, bacillary dysentery, malaria, lymphogranuloma venereum and granuloma inguinale, trypanosomiasis, amoebiasis, fungus diseases, leprosy, spirochaetosis, bejel, yaws, pinta, leptospirosis, relapsing fever, bartonellosis and plague.

The contributors and the New York Academy of Sciences are to be congratulated on this excellent volume.

REGINALD M. ATWATER

Psychiatric Aspects of Rehabilitation—*by Morris Grayson in collaboration with Ann Powers and Joseph Levi. (Rehabilitation Monograph II). New York: The Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center,* 1952. 86 pp. Price, $1.00.

Lest we forget, and there is evidence that we often do, physical disability almost invariably produces emotional sequelae in the affected person. Unless the rehabilitation team includes members competent to recognize and manage emotional trauma, many patients will be abandoned as "not feasible" for rehabilitation, or with only superficial results achieved. It is the old story about, "You can lead a horse to water . . . etc." In the instance of the patient we all too often find outright rejection or indifferent acceptance of physical modalities in the absence of measures which are directed toward his emotional needs. As Doctor Grayson states the problem, "Medical writings abound in reference to 'the total individual,' yet on careful examination, one observes that the emphasis is primarily on the physical dynamisms of the human structure." In reviewing instances in which patients have failed to progress toward rehabilitation goals which have been set, this observer has found numerous examples in which the patient had little, if any, understanding as to what was happening; rarely any share in the planning which led to the formulation of his rehabilitation goal. Treatment was obviously directed at somatic foci constituting the patient's ostensible disability, with complete or partial ignorance of underlying emotional difficulties.

This monograph is the product of a study supported by a three-year grant from the Commonwealth Fund. It comes as a welcome and important contribution to the literature on rehabilitation. To the credit of its authors, it is a well written, easily comprehended presentation of a special field of medical care which all too often is bypassed in the management of patients disabled by injury or chronic illness. Its real worth is in the discerning analysis and comment which its author and his collaborators developed as the result of their experience with some 400 patients at the Institute of Physical Medicine and Rehabilitation.

The report is presented in the four sections which follow the introduction. There is first, the "Report of the Psychiatrist." In this section is outlined the methodology of the study, the factors which were studied, symptoms and symptom formations, factors in rehabilitation, psychotherapy in rehabilitation,

and the role of the psychiatrist in rehabilitation.

This work will be a worth-while addition to the library of the rehabilitation worker regardless of his field of specialization for it has much useful and practical guidance for which the reader will find almost daily application.

BERNARD D. DAITZ

Chemistry of Food and Nutrition —*By Henry C. Sherman (8th ed.). New York: Macmillan,* 1952. 721 pp. Price, $6.00.

This is the eighth edition of a familiar and respected college text and reference book. Those who have used former editions of it will welcome the revision. Those who seek a scientific explanation of the modern concept of nutrition, which has been scrutinized, evaluated, and interpreted, could find no better reference.

As the author states in the preface, "every chapter has been revised, several of them rewritten, a new chapter on folic acid, vitamin B_{12} and the citrovorum factor has been inserted . . ." and two new chapters relating to food consumption trends and potential effects of further nutritional improvements have been added.

The inclusion of recent advances in nutrition along with greater emphasis upon the implications these hold for public health practices and planning has apparently necessitated the deletion of certain familiar sections of the book, as for example, the interpretation of statistical methods. Some teachers will regret such omissions even though other texts and other courses may supply the information.

Dr. Sherman's writing has always been noted for its economy of words and clarity of expression. This edition demonstrates again his ability to present and interpret scientific information in a manner which holds the interest of the reader and gives him confidence in the authenticity of the facts. The revised and extensive bibliographies at the end of each chapter support the data included and afford the student an opportunity to become familiar with details from which he can form his own opinions.

BERTLYN BOSLEY

Third Inter-American Congress on Brucellosis. *Held Under the Joint Auspices of the Inter-American Committee on Brucellosis, the United States Committee on Brucellosis of the National Research Council, and the Pan American Sanitary Bureau Regional Office, World Health Organization—Meeting in Washington, D. C., November 6–10, 1950. Washington, D. C.: National Research Council,* 1952. 302 pp. Price, $5.00 cloth; $3.25 paper.

Authoritative information is presented concerning the world-wide distribution of brucellosis, with special reference to Cuba, Mexico, the South American countries, and the United States. Twenty-one articles are in English with a summary in Spanish and 10 in Spanish with a summary in English.

There is detailed discussion of control measures against the disease and of the natural course of bovine brucellosis, of swine brucellosis, and of the infection among goats in Colorado, Mexico, and the Argentine. Careful consideration is given to the clinical course of acute, subacute, and chronic brucellosis of man, based in particular on recent studies in Minnesota. Of further interest and import is an article entitled "What Should Be Done with the *Brucella* Skin Test." Another paper deals with "Brucellosis, A Packing Plant Problem."

Laboratory studies are presented dealing with aspects such as the Ring Test in the diagnosis of animal brucellosis; "use of the embryonating egg for isolation of *Brucella*. . ."; "physical properties and agglutinability of *Brucella*

antigens"; "carbon dioxide requirements of *Brucella abortus*"; "preparation and properties of abortus vaccine (strain 19)." Other articles discuss results of treatment with various antibiotics. Included also are names of committee members, and alphabetical lists with home addresses of authors and participants. Following nearly all of the articles are many related references.

CARL F. JORDAN

Kitchen Strategy—*By Leona M. Bayer and Edith Green. Springfield, Ill.: Thomas,* 1952. 94 pp. Price, $3.75.

This book is written for the homemaker to help her with menu planning, marketing, and food preparation for the family.

A brief summary is given of each of the nutrients, including functions, daily needs and good common food sources. This nutrition section is given more emphasis than in the usual cookbook. The section devoted to sample menus that interpret diet orders for common ailments will be helpful to homemakers. Good suggestions are given for marketing, coordinating child and family menus, and developing good food habits. The recipe section is devoted mainly to basic recipes, with many variations, and to general rules for good food preparation, such as for vegetable cookery and egg cookery.

The homemaker, especially the beginner, should find it a useful and practical supplement to the usual cookbook.

RUTH BRENNAN

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Tuberculosis—*By Saul Solomon. New York: Coward-McCann,* 1952. 310 pp. Price, $3.50.

This volume is one of a series of "nontechnical books for the general reader." The author's style makes for easy reading, but he is caught up by the difficulties of compromising lay and professional terminology. On the whole, he inclines toward the latter, and therefore, the book is more valuable to such categories of readers as nonmedical public health workers, tuberculosis association employees, social workers, and others who can approach the subject with the background of their own technical discipline.

For such paramedical readers, this volume is the best to come to the attention of this reader. In short compass, it covers the field very thoroughly, including stimulating sections devoted to statistics, rehabilitation, psychology, and BCG, subjects which are usually mentioned only in passing in similar works. The last chapter "A Program to Wipe Out Tuberculosis," is outstanding, and could be used as a guide by tuberculosis control officers. The glossary of terms at the end of the book adds to its usefulness as a reference. Frequent historical and literary references blend well with the subject matter. Dr. Solomon's warm personal feeling for the tuberculosis patient flows out from the pages of the book. The work is highly recommended.

EDWARD KUPKA

The Encyclopedia of Nursing—*Edited by Lucile Petry. Philadelphia, Pa.: Saunders,* 1952. 993 pp. Price, $4.75.

Nurses have long used medical dictionaries and similar references to check their technical information. Now, for the first time, scientific and technical information as it relates to nursing practice has been brought together in one volume for ready access.

The material was selected by a review of current nursing texts, to identify the content considered significant in nursing. All items are clearly and comprehensively cross-indexed, so that local variation in terminology does not limit the usefulness of the book.

Where it is appropriate, discussion of an item goes beyond definition or general description, to *how* it applies in the practice of nursing. For example, under

"Ether," there is a subheading, "Bed," and not only is the purpose of such a bed noted, but also those things which are necessary to prepare and properly use one are included.

As is probably inevitable in a first compilation of this sort, the specialist can seek, without success, for some of the significant content in his field. For example, the current emphasis in public health nursing on development of "Combination Agencies" is not reported under any heading which the reviewer could locate. Such omissions do limit the value of any attempt at a comprehensive recording of present-day nursing and the bases for its practice.

In spite of this, the book should prove a valued and well used addition to our public health libraries.

DOROTHY WILSON

Clinical Obstetrics—*By Clifford B. Lull and Robert A. Kimbrough. Philadelphia, Pa.: Lippincott,* 1953. 732 pp. Price, $10.00.

Those who are specialists in obstetrics can appropriately evaluate the clinical aspects of this volume, but for the non-specialist it appears to be exceptionally well done. The medical student of today has an enormous advantage over those of an earlier generation in the excellence of the presentation.

Public health workers will be glad to see a good emphasis on preventive medicine and the community aspects of pregnancy reflected in this volume. The chapter on nutrition and nutritional deficiencies in pregnancy by Winslow T. Tompkins reveals a modern concept of this important foundation stone. Likewise the chapter on toxemias of pregnancy is up to date. The sections on the newborn and on maternal and neonatal mortality should be useful in helping the young physician to see the importance of preventive medicines. A feature of the volume is an outline of obstetric nursing practices, which spells out in detail management of a good obstetric service from the nursing standpoint.

This volume, which reflects the teaching of the staff of the Pennsylvania Hospital, can be commended.

REGINALD M. ATWATER

Microbiology — *By Florence C. Kelly and K. Eileen Hite. New York: Appleton-Century-Crofts,* 1952. 592 pp. Price, $5.50.

This volume is suitable for the beginning student who will be most interested in the medical aspects of Microbiology. The first half of the book deals concisely with basic principles, introduction to microorganisms, their biology, metabolism, cultivation, etc., and glances briefly at their role in industry, soil fertility, etc. The second half deals more fully with surgical and medical aspects; chemotherapy; pathogenesis; immunology and specific infectious organisms and processes; bacterial, viral, rickettsial, protozoal, fungal, etc.; epidemiology and public health, etc. The book is especially well illustrated. An appendix contains a list of stain formulas, with methods; indicators; formulas for culture media and methods for their preparation; and a chronological list of important steps in the advance of our knowledge of microbiology. Bibliographical material consists largely of lists of well selected books and some appropriate recent periodical publications. These are arranged for each chapter, all together, following the appendix. The book is attractively bound and well printed and indexed. A foreword by Dr. G. M. Dack, professor of bacteriology, University of Chicago, opens the book under especially good auspices.

MARTIN FROBISHER

Cancer In Man—*By Sigismund Peller. New York: International Universities Press,* 1952. 556 pp. Price, $12.00.

A highly controversial treatise written primarily for the statistically-minded

scientist who is interested in the theoretical aspects of cancer. The book provides an excursion into the realm of unorthodox thinking in cancer prevention and treatment, which was particularly prevalent in Europe during the 1920's. The author explains that the opposition to his conclusions and deductions has followed him through the years, both abroad and in this country, and that much of it is due to the lack of familiarity with his early writings, an omission which he attempts to correct through the medium of this text.

In 1925 Dr. Peller suggested that cancer prophylaxis may be served by the use of roentgen treatment of the cervix in every woman between the ages of 35 and 40 years. He now believes that we can cut down on cancer mortality for a population without cutting down cancer incidence. His credo may be summed up in "This we can do by provoking cancer in the organ of our choice, the skin, thus shielding and protecting the inner organs where cancer is highly fatal." This theory may be interesting, but remains unsupported by any convincing clinical observations from current medical practice.

Cancer in Man is recommended reading for physicians who know statistical methodology and are familiar with the special problems posed by cancer. Familiarity with abberrations produced by statistical method and an appreciation of the difficulties which are encountered in collecting cancer data, will stand the reader in good stead as he examines over 124 pages of statistical data, including the discussion of formulas, graphs, and tables, which are presented by Dr. Peller in support of his unorthodox thesis on prevention of cancer deaths. L. S. SNEGIREFF

Health Instruction Yearbook 1952 —*By Oliver E. Byrd. Stanford, Calif.: Stanford University Press,* 1953. IX plus 232 pp. Price, $3.50.

This is the tenth *Yearbook* compiled by Dr. Byrd, and as in preceding years it is a useful compilation. The book is divided into 22 sections, covering such topics as nutrition, exercise and body mechanics, fatigue and rest, safety, family health, school health, occupational health, community health services, mental health and disease, international health, and health as a social problem. Particularly useful are the summaries of information on new drugs, such as isonicotinic acid hydrazide in the treatment of tuberculosis. There is a bibliography, an alphabetical list of sources, an author index, and a subject index. All in all, this volume is a handy source of information for public health workers. GEORGE ROSEN

Personality Measurement — *By Leonard W. Ferguson, New York: McGraw-Hill,* 1952. 457 pp. Price, $6.00.

• This book fills a needed gap in the literature on the measurement of human personality, for it gathers together a wealth of research on the many and varied approaches to personality measurement which have characterized this elusive area. Moreover, in the very process of organizing the material for presentation, the author has added a needed structure to the field, resulting in greater clarification and identification of the basic principles and procedures involved.

After a brief chapter on "Fundamental Concepts," which can do little more than set the stage, the author describes and evaluates 14 major methodologies in personality measurement, an ingenious organizational structure which integrates and inter-relates the basic research and instruments used. Interest measurement is characterized by the empirical and rational approaches; attitudes by the *a priori* and *a posteriori* approaches; personality traits by the unidimensional and multidimensional

approaches; adjustment by the diagnostic and prognostic approaches. Ratings are broken down into the nonanalytical and analytical approaches; projective technics into the perceptual and imaginal approaches; and performance into the observational and experimental approaches. For each approach underlying rationale, problems in measurement, and illustrative instruments or procedures are given.

This is a useful book for many reasons—as a guide to measurement procedures, as a source of information on most of the commonly used instruments, as a survey of the literature, and as a stimulant for needed research. Although some sophistication in statistics is necessary, it is not a highly technical presentation and the style is quite readable. Although the author is a psychologist, the book will be a valuable addition to the libraries of many professional groups other than psychologists, particularly sociologists, teachers, social workers, physicians, statisticians, i.e., any group interested in the evaluation of human personality.

ALBERT S. THOMPSON

Opportunities in Nursing — *By Edith Patton Lewis. New York: Vocational Guidance Manuals, Inc.* 1952. 128 pp. Price, $1.00.

This little manual will be welcomed by all who must try to answer honestly and with current facts the questions asked by young people who are considering nursing as a career. It has a place in the staff library of any public health or public health nursing office as well as in each high school library for students to read. The high school nurse and vocational guidance teacher will find it essential for their own reference shelves.

The material is sound and inclusive, covering professional and practical nursing, for men as well as women and the differences between diploma and degree programs. The various fields for practice are pictured fairly and in helpful detail.

The presentation is realistic and takes care of any false ideas of traditional romanticism which might still be lingering in adolescent minds. However attention is given to the possibilities of the nurse's "life" as well as career. The interesting account of the author's successful combination of the two makes one wish more such thumbnail sketches of real nurses might have been included to illustrate possibilities of a nice integration of personal life and professional career.

The book is well organized. There is a helpful index. The table of contents includes subtitles alluringly enough stated to be suitable for use by a person who must give a short talk on the subject to a nonprofessional group of any kind.

MARIE SWANSON

Understanding Stuttering — *By A. B. Gottlober. New York: Grune and Stratton,* 1953. 262 pp. Price, $5.50.

The author, psychologist and specialist in speech rehabilitation, has approached the problem of stuttering from a broad point of view. He discusses "stuttering," not only as an "ever present . . . embarrassing, degrading and crippling" condition afflicting well over a million persons in the United States, but he describes the nature and causes of the disorder, and the physical, psychological, and social environment in which it develops. The author concludes that therapy must take into consideration the whole person and that the stutterer's chances of happiness and success are equal to that of any average person if he works toward them in the right way. Methods of therapy are outlined and a list of references is appended.

The book is written for "stutterers, beginners and old-timers . . . for their relatives and friends, and . . . for parents of potential stutterers. School teachers

. . . , visiting nurses, social workers and all other professional people whose business is human welfare may find material in these pages which will enable them to give counsel and some aid to many thousands of stutterers who would otherwise receive no understanding and no help."

The material is scientifically up to date, the language easy to understand, and the whole text is absorbing and interesting. ELINOR F. DOWNS

Expert Committee on Trachoma. First Report. *WHO Technical Report Series No. 59. New York: Columbia Univ. Press,* 1952. 24 pp. Price, 15¢.

This report contains the collective views of an international group of experts on trachoma and other opthalmias. There were represented on the committee ophthalmologists from Italy, Egypt, Japan, Portugal, Tunisia, Morocco, and the United States, the latter being Dr. Phillips Thygeson of San Francisco.

The report considers the chemotherapy of trachoma, the methods of trachoma control applicable in underdeveloped countries, prophylaxis of trachoma in international traffic, observations on international cooperation in trachoma research, classification of trachoma, and annexes relating to problems considered suitable for cooperative research at an international level and problems considered suitable for individual research.

All those dealing with the public health aspects of trachoma should be aware of this report which brings to bear on the problem modern methods of distinguishing trachoma from other conditions with which it is confused.

The report is highly recommended for the purposes indicated.

REGINALD M. ATWATER

BOOKS RECEIVED

Listing in this column acknowledges the receipt of books and our appreciation to the senders. Space and the interests of readers will permit review of some, but not all, of the books listed.

ADJUSTMENT TO PHYSICAL HANDICAP AND ILLNESS: A SURVEY OF THE SOCIAL PSYCHOLOGY OF PHYSIQUE AND DISABILITY. Robert G. Barker (rev.). New York: Social Science Research Council, 1953. 440 pp. Price, $2.00.

AIDS TO PUBLIC HEALTH. Llywelyn Roberts (7th ed.). Baltimore, Md.: Williams & Wilkins, 1952. 313 pp. Price, $2.25.

BIOLOGICAL STAINS. H. J. Conn (6th ed.). Geneva, N. Y.: Biotech Publications, 1953. 367 pp. Price, $5.00.

BODILY CHANGES IN PAIN, HUNGER, FEAR AND RAGE. Walter B. Cannon (2nd ed.). Boston, Mass.: Charles T. Branford, 1953. 404 pp. Price, $5.00.

CHILDREN OF DIVORCE. J. Louise Despert. New York: Doubleday, 1953. 282 pp. Price, $3.50.

CONCEPTION OF DISEASE, THE. ITS HISTORY, ITS VERSIONS AND ITS NATURE. Walther Riese. New York: Philosophical Library, 1953. 120 pp. Price, $3.75.

FROM THE WORKSHOP OF DISCOVERIES. Otto Loewi. Lawrence, Kans.: University of Kansas Press, 1953. 62 pp. Price, $2.00.

FUNCTIONAL DISORDERS OF THE FOOT. Frank D. Dickson and Rex L. Diveley. Philadelphia, Pa.: Lippincott, 1953. 345 pp. Price, $6.75.

GREATER INDUSTRIAL HEALTH, THE. 17TH ANNUAL MEETING OF INDUSTRIAL HYGIENE FOUNDATION. Transactions Bulletin No. 22, 1952. Pittsburgh, Pa.: Industrial Hygiene Foundation of America, 1953. 98 pp. Price, $1.50.

HEALTH SABOTEURS. A CONTROVERSIAL BOOK ON TONSILS AND ADENOIDS. Robert William Davis. New York: Pageant Press, 1953. 306 pp. Price, $4.00.

HEATING, VENTILATING AND AIR CONDITIONING, 1953. Vol. 31. New York: American So-

ciety of Heating and Ventilating Engineers, 1953. 1560 pp. Price, $7.50.

HISTORY OF ANESTHESIA. Virginia S. Thatcher. Philadelphia, Pa.: Lippincott, 1953. 289 pp. Price, $5.00.

HOW TO PREPARE FOR MARRIAGE. John Douglas and Elizabeth Hardy. New York: Pageant Press, 1953. 134 pp. Price, $2.50.

INTRODUCTION TO PUBLIC HEALTH, AN. Harry S. Mustard (3rd ed.). New York: Macmillan, 1953. 315 pp. Price, $4.25.

IT'S NOT ALL IN YOUR MIND. H. J. Berglund and H. L. Nichols, Jr. Greenwich, Conn.: North Castle Books, 1953. 343 pp. Price, $3.95.

MAINTOWN DENTAL HEALTH PROJECT. HERE'S A PROJECT FOR YOUR TOWN. Chicago, Ill.: American Dental Association, 1953. 10 pp. 25 copies, $3.20, 50 copies, $5.50, 100 copies, $9.35.

MAN'S FOODS. Lloyd B. Jensen. Champaign, Ill.: Garrard Press, 1953. 278 pp. Price, $4.50.

MICROBIOLOGY AND HUMAN PROGRESS. Madeleine Parker Grant. New York: Rinehart, 1953. 718 pp. Price., $6.75.

MILK ORDINANCE AND CODE. 1953 RECOMMENDATIONS OF THE PUBLIC HEALTH SERVICE. Washington, D. C.: U. S. Gov. Ptg. Office, 1953. 242 pp. Price, $.75.

MODERN MANAGEMENT FOR THE CITY OF NEW YORK. Vol. I. Mayor's Committee on Management Survey of the City of New York. New York City. 1953. 307 pp.

MODERN TREATMENT—A GUIDE FOR GENERAL PRACTICE BY 53 AUTHORS. Edited by Austin Smith and Paul L. Wermer. New York: Hoeber-Harper, 1953. 1146 pp. Price, $20.00.

NORMAL CHILD, THE. Ronald S. Illingworth. Boston, Mass.: Little, Brown, 1953. 342 pp. Price, $6.00.

OVEREATING, OVERWEIGHT AND OBESITY. PROCEEDINGS OF THE NUTRITION SYMPOSIUM, HARVARD SCHOOL OF PUBLIC HEALTH, BOSTON, MASS., October 29, 1952. David P. Barr, John R. Brobeck, *et al.* New York: National Vitamin Foundation, 1953. 151 pp. Price, $1.50.

PHYSIOLOGY OF EXERCISE. Laurence E. Morehouse and Augustus T. Miller. St. Louis, Mo.: Mosby, 1953. 355 pp. Price, $4.75.

PSYCHIATRIST AND THE LAW, THE. Winfred Overholser. New York: Harcourt, Brace, 1953. 147 pp. Price, $3.50.

PSYCHOLOGY AND PSYCHOTHERAPY OF OTTO RANK, THE. Fay B. Karpf. New York: Philosophical Library, 1953. 129 pp. Price, $3.00.

ROOTS OF PSYCHOTHERAPY, THE. Carl A. Whitaker and Thomas P. Malone. New York: Blakiston, 1953. 236 pp. Price, $4.50.

SALUD Y LIBERTAD. ORACIONES DE UN CREYENTE. Carlos Enrique Pas-Soldan. Lima, Peru: Biblioteca De Cultura Sanitaria, 1953.

SCIENTIFIC PRINCIPLES IN NURSING. M. Esther McClain (2nd ed.). St. Louis, Mo.: Mosby, 1953. 449 pp. Price, $3.50.

SOCIAL PROGRAM FOR OLDER PEOPLE, A. Jerome Kaplan. Minneapolis, Minn.: University of Minnesota Press, 1953. 158 pp. Price, $3.00.

STANDARDS OF CARE FOR OLDER PEOPLE IN INSTITUTIONS. SECTION I — SUGGESTED STANDARDS FOR HOMES FOR THE AGED AND NURSING HOMES. New York: National Social Welfare Assembly, National Committee on Aging. Price, $1.00.

STARCH—ITS SOURCES, PRODUCTION AND USES. Charles A. Brautlecht. New York: Reinhold, 1953. 408 pp. Price, $10.00.

TEXT-BOOK OF PUBLIC HEALTH (Formerly HOPE AND STALLYBRASS). W. M. Frazer 13th ed.). Baltimore, Md.: Williams & Wilkins, 1953. 663 pp. Price, $8.50.

VIRUS AND RICKETTSIAL CLASSIFICATION AND NOMENCLATURE. Annals of the New York Academy of Sciences, Vol. 56, Art. 3, March 31, 1953. Roy Waldo Miner, Editor. New York: N. Y. Academy of Sciences, 1953. pp. 381–622. Price, $4.00.

WATER SUPPLY AND SEWERAGE. Ernest W. Steel (3rd ed.). New York: McGraw-Hill, 1953. 582 pp. Price, $8.00.

YEARBOOK OF PSYCHOANALYSIS. Vol. VIII. Sandor Lorand, Managing Editor. New York: International Universities Press, 1952. 385 pp. Price, $7.50.

YOUR DIABETES AND HOW TO LIVE WITH IT. Floyd L. Rogers and Ruth M. Leverton. Lincoln, Neb.: University of Nebraska Press, 1953. 113 pp. Price, $2.50.

YOUR FEET ARE KILLING YOU. Simon J. Wikler. New York: Frederick Fell, 1953. 214 pp. Price, $3.50.

A SELECTED PUBLIC HEALTH BIBLIOGRAPHY WITH ANNOTATIONS

RAYMOND S. PATTERSON, PH.D.

Lung Cancer Bucks Trend—Had the 1945 death rate prevailed in 1950, there would have been an excess of 204,000 deaths over the actual figure. Savings were chiefly in cardiovascular diseases, pneumonia, tuberculosis, and accidents. Among all important causes only respiratory cancer exceeded the expectancy based on 1945 rates.

ANON. Large Postwar Saving in Lives. *Statist. Bull. Metrop. Life Insur. Co.* 34, 3:4 (Mar.), 1953.

Efficient Medical Organization—One bright spot in an otherwise gloomy picture is ". . . mortality among the (Korean War) wounded (who were) reached for treatment was only about 2 per cent, or approximately half that in World War II." Of the battle deaths, 27 per cent were under age 20. Deaths from disease are few—only about a tenth of those caused by enemy action.

ANON. Deaths Among Military Personnel. *Statist. Bull. Metrop. Life Insur. Co.* 34, 3:1 (Mar.), 1953.

Judges Turn the Crank—Reviewed here are legal decisions establishing that fluoridation of water supplies is not an unconstitutional invasion of religious freedom, that it is a permissible exercise of police power, and that it will not create municipal tort liability.

BELL, W. H. Legal Aspects of Water Fluoridation. *Modern San.* 5, 3:61 (Mar.), 1953.

Q Fever Round-Up—*Coxiella burnetii*, the Q fever organism, has been found in every continent and clime, in man and in domestic animals and rats, in ticks and body lice, and in the dust about barns. Ubiquitous, seems the word for it!

BERGE, T. O., and LENNETTE, E. H. World Distribution of Q Fever: Human, Animal and Arthropod Infection. *Am. J. Hyg.* 57, 2:125 (Mar.), 1953.

Wages of (Gastronomic) Sin—"Significantly associated" with overweight are heart disease, hypertensive vascular disease, arthritis, diabetes, and gallbladder disease—sometimes in morbid combinations of one sort or another.

DOWNES, J. Association of the Chronic Diseases in the Same Person and Their Association with Overweight. *Milbank Mem. Fund Quart.* 31, 2:125 (Apr.), 1953.

Teamwork Gets Results—As useful as it is readable is this detailed account of the way state and federal and local officials went about working together to combat an anticipated outbreak of encephalomyelitis. So formidable a foe called for a skillfully planned and executed attack.

HALVERSON, W. L., *et al.* The 1952 Encephalitis Outbreak in California. *Pub. Health Rep.* 68, 4:369 (Apr.), 1953.

Fleeting Protection — After a week's build-up, gamma globulin protects against paralytic polio for four solid weeks, then during the sixth to the eighth week protection wanes, after that it is gone. For us this is the most noteworthy item in the findings of the fourth and final report of this outstanding piece of research.

HAMMAN, W. McD., *et al.* Evaluation of Red Cross Gamma Globulin as a Prophylactic Agent for Poliomyelitis. *J.A.M.A.* 151, 15: 1272 (Apr. 11), 1953.

Evaluating Program and Performance—Why do administrators tend to shy away from evaluation? What are

some of the sins of earlier attempts at evaluating that have built up resentment against it? The entire last issue of the first volume of "A L" is given over to the subject. But the answers to the two questions posed above will provide a bountiful cud for public health administrator rumination.

HENDRY, C. E. What Price Honesty? *Adult Leadership* 1, 11:3 (Apr.), 1953.

Problem Family Problems—Glancing back over a quarter-century of desultory but wide-ranging browsing, I cannot recall as thorough an airing of this subject as that given in a recent (British) symposium—not in an American public health gathering, at any rate. A question naturally evolves: are problem families an odorous matter that might be similarly ventilated in our deliberations? Or, happily, are they outside our administrative province?

MCDONAGH, V. P., *et al.* Toward the Eradication of the Problem Family. *J. Roy. San. Inst.* 73, 2:92 (Mar.), 1953.

Coincidence — A costume street parade—with free ice cream and a free movie as added attractions—induces the youngsters in this rural community to have their carious teeth repaired. On the same page with this story is a boxed filler entitled "Teaching Methods Change."

OXLEY, H. A. County-Wide Dental Health Program. *Nursing Outlook* 1, 3:143 (Mar.), 1953.

It Still Happens Here—She was sick only a few days—with fever and diarrhea. When she went back to work at the catering establishment, she was set to chopping cooked liver. Then for the next two days the caterer served the liver at a number of parties, and the explosive results were what you might expect! The wonder is it doesn't happen oftener.

RUBENSTEIN, A. D., and MACCREADY, R. A. Epidemic *Salmonella newport* Infection in a Metropolitan Area. *New England J. Med.* 248, 13:527 (Mar. 26), 1953.

Not for Sloganeers—"The question inevitably and cogently arises whether the plea for early treatment (of suspected cancer) has a warrant behind it." The point is made that though Stage I cancers, when treated, do offer a better chance of survival than Stages II or III, the duration of recognizable symptoms and stage of the disease do not by any means amount to the same thing.

RUSS, S. Is Early Treatment Essential in Cancer? *Brit. M. J.* 4810:580 (Mar. 14), 1953.

Polio Milestone—So completely exploited in the daily press, the weekly news magazines, and the speedier vehicles of the scientific information, were the findings of the epoch-making study of active immunization against poliomyelitis that it seems necessary only to record here the periodical in which the report appeared and the date of issue.

SALK, J. E. Studies in Human Subjects on Active Immunization Against Poliomyelitis. *J.A.M.A.* 151, 13:1081 (Mar. 28), 1953.

Scientific Confirmation — In the population studied certain children, certain adults, and certain families enjoyed more than their share of disabling respiratory illnesses—scientific confirmation of a fact-of-life that most of us would have surmised based on our own day-to-day observation.

TUCHER, D., and DOWNES, J. Disability from Respiratory Illness. *Milbank Mem. Fund. Quart.* 31, 2:141 (Apr.), 1953.

From the Soke of Peterborough—Even as we do, the British health authorities struggle with the tough problem of what constitutes the minimal effective health unit. Aren't you intrigued by the paper's title? You'll be well repaid if you hunt it out for there is a moral to it—as the Duchess assured Alice there must be.

VAWSER, G. T. The Small Authority in the

Welfare State. *J. Roy. San. Inst.* 73, 2:109 (Mar.), 1953.

Many Hands—A school nurse stirs up a small town committee to undertake a community safety project. It began with a house-to-house survey of home accidents and next year a follow-up survey is planned to see what the program accomplished.

WETZEL, M. A Home Accident Survey. *Nursing Outlook* 1, 3:149 (Mar.), 1953.

Where There's a Will There's an Alibi—Of 56 new mothers questioned about their reasons for breast feeding, or bottle feeding their babies, only two said their doctors had influenced their choice—one for and one against! The ostensible reasons for the others' decisions included most of the usual ones and some ingenious new ones too.

WOLFF, I. S. Mother's Views on Breast Feeding. *Nursing Outlook* 1, 3:145 (Mar.), 1953.

If additional information is desired regarding the articles listed in this Bibliography, please communicate directly with the publications in which they appeared; the addresses are furnished for your convenience.

Adult Leadership, Adult Education Association of the United States, 743 N. Wabash Ave., Chicago 11, Ill.

Am. J. Hyg. (American Journal of Hygiene), 615 N. Wolf St., Baltimore 5, Md.

Brit. M. J. (British Medical Journal), British Medical Association House, 19 Tavistock Sq., London, W.C. 1.

J.A.M.A. (Journal of the American Medical Association, 535 N. Dearborn St., Chicago 10, Ill.

J. Roy. San. Inst. (Journal of the Royal Sanitary Institute), 90 Buckingham Palace Road, London, S.W. 1.

Milbank Mem. Fund Quart. (The Milbank Memorial Fund Quarterly), 40 Wall St., New York 5, N. Y.

Modern San. (Modern Sanitation), 855 Avenue of the Americas, New York 1, N. Y.

New England J. Med. (New England Journal of Medicine), Massachusetts Medical Society, 8 The Fenway, Boston 15, Mass.

Nursing Outlook, American Journal of Nursing Company, 2 Park Ave., New York 16, N. Y.

Pub. Health Rep. (Public Health Reports), Superintendent of Documents, Gov. Ptg. Office, Washington, D. C.

Statist. Bull. Metrop. Life Insur. Co. (Statistical Bulletin Metropolitan Life Insurance Company), 1 Madison Ave., New York 10, N. Y.

Public Health in Foreign Periodicals

GEORGE ROSEN, M.D., PH.D., F.A.P.H.A.

NOTE: This is the last of a series of three columns devoted to Asian countries. The first and second columns appeared in the December, 1952, and the March, 1953, issues of the *Journal*.

POLIOMYELITIS IN INDONESIA

Reports on poliomyelitis in Indonesia have been published regularly since 1935, and it is clear that the disease was endemic before World War II.[1] In the years immediately preceding the war small groups of cases were seen occasionally in the larger cities and towns of Java and elsewhere. Children were chiefly affected, and all ethnic groups were involved (Indonesian, Chinese, European). During 1947, 1948, and early in 1949, more cases than ever before were recorded in Batavia. Twenty-one patients were observed between June, 1948, and January, 1949, preceded by two other cases occurring in October and November, 1947. Though the total number of patients (23) is the largest ever described in Indonesia up to 1949, it is quite small in relation to the total population of Batavia. Very likely, cases occurred which were never reported. Nine patients were adults, most of them recently arrived in the Indies.

No measures were taken to prevent further progress of the outbreak, since there appeared to be no common source of infection. The patients lived in different parts of Batavia, often miles apart. Nor did they have any social relations as they belonged to different ethnic groups and social classes. In no instance were two cases found in one house, though most houses were terribly overcrowded. The outbreak stopped in the middle of January, 1949, without apparent reason. As far as the author has been able to establish, no such outbreak has ever before been observed in the Far East, except in Australia.

INCIDENCE OF CANCER IN INDONESIA

Kouwenaar presents figures on the incidence of cancer among Javanese and Chinese laborers on tobacco and rubber plantations in Sumatra.[2] In addition, there are some observations on the Bataks of the same island. If the age distribution of the population is taken into account, the over-all frequency of malignant tumors is about the same as in Europe. The majority of cancers in Javanese men affect the liver. This type of cancer is also quite common in Bataks and Chinese. The author suggests that diet may be responsible for the frequency of hepatic cancer. However, cancer of the stomach is about as frequent as liver cancer in Chinese men. On the other hand, gastric cancer is seldom seen in Javanese men and women. This applies as well to gastric and duodenal ulcers. The incidence of ulcers in Chinese is about the same as in other countries, while among Javanese ulcers are very rare. Among Bataks, however, ulcers and cancer of the stomach are found regularly. Cancer of the penis is frequently seen in circumcised Javanese. In Javanese women uterine and mammary cancers are the most commonly found malignant tumors. Cancer of the mouth (gums and cheek) is relatively frequent. Cancer and melanoma of the skin are usually localized on the face, the legs, and the feet.

RATS AND MITES IN THE TRANSMISSION OF EPIDEMIC SCRUB TYPHUS IN BATAVIA

A few cases of scrub typhus are found in Batavia almost every year. The first

epidemic of scrub typhus in an urban area in Java was described in 1949 by Gispen, Smit, and Westermann.[3] Most of the infections originated in a circumscribed focus in the Duku district along the Bandjir canal in Batavia. This epidemic provided an opportunity to study the role of mites and rats in the transmission of scrub typhus in Batavia. According to Gispen, little is known about the animal reservoir of scrub typhus in Sumatra. Four hundred and one mammals (342 rats and 59 shrews) were caught and examined. *Trombicula akamushi* was present on 10 out of 104 animals. The presence of *akamushi* larvae in the alang grass of the epidemic area was definitely established. There appeared to be a correlation between the possibility of rats being attacked by *akamushi* larvae and the risk of the human population being infected with scrub typhus. There is no such correlation with other species of mites. It was established that the agent of the disease (*Rickettsia orientalis*) was present in *Rattus rattus diardi* in the epidemic area. However, this rat is not considered the local reservoir of infection. It is felt that hosts other than rats are responsible for the transport of *Trombicula akamushi* into urban districts. Investigation is being continued, especially with respect to birds.

ENDEMIC TYPHUS IN JAVA

Shop typhus (urban tropical typhus) occurs in Indonesia as an endemic disease, especially in urban areas.[4] Clinically the infection resembles murine typhus and both diseases are believed to be closely related. The authors describe the virus isolated from a case of shop typhus. Pathologically, morphologically, and serologically it was indistinguishable from cosmopolitan murine typhus. The main feature of the epidemiology of the disease is its close connection with human habitations. Cross complement-fixation tests showed no differences between four Javanese strains originating respectively in man, rat, flea, mite, and the American murine typhus strain. No serological relationship could be demonstrated between these strains and a Javanese scrub typhus strain.

NUTRITION IN JAVA AND THE SURROUNDING ISLANDS, 1946–1950

Luyken[5] gives a survey of the Institute for Nutritional Research at Djakarta from July, 1946, to July, 1949, in Java and the nearby islands. Conditions were unsettled as a result of the war, and systematic investigations were greatly hampered. Clinical and biochemical investigations were carried out on laborers, school children, children in institutions, in camps for the homeless, messes, hospitals, prisons, and military compounds. It was found that deficiencies were the same as before the war, particularly with regard to proteins and vitamin A. The chaotic conditions during and after the war added a deficiency of calories. In addition, a heavy increase in tropical diseases contributed to the very unfavorable nutritional situation. Children were much retarded in growth. The supply of thiamin and ascorbic acid in institutions, hospitals, and messes often left much to be desired.

WEIGHT AND LENGTH OF NEWBORNS IN DJAKARTA

The purpose of this study was to determine the average weight and length at birth of children in Djakarta and to study any factors which might influence them.[6] A total of 2,497 children was examined; of these 1,243 were Indonesian, 866 Chinese, and 388 European. All were full-term children of healthy mothers. There were no significant differences between the average birth weight and length of Indonesian and Chinese children. European children gave higher figures, but there is no

proof that this was due to any racial factors as the social milieus of the mothers was not the same for the various groups. The average birth weight of Indonesian, Chinese, and European children was 3,006 σ 11.5+g., 3,044 σ 13.54g., and 3,386 σ 25.62g., respectively. The average height was 48.4 σ 0.05 cm., 49.2 σ 0.06 cm., and 50.1 σ 0.10 cm., respectively. There were no significant differences in average birth weights and lengths of children born from mothers of the same parity, even when the mothers differed in age by as much as ten years. No significant differences in birth weight and length were observed when the groups of mothers were classified according to family income, though all differences indicated that a higher weight and length tended to occur in groups with higher income. There was a significant difference in the Indonesian group between the weight and length at birth of children born from mothers who had been well nourished during pregnancy and those in whom nutrition had only been moderate. A similar difference was found in the Chinese group.

MALARIA AND PREGNANCY AT SAIGON

Hung[7] studied the effects of malaria on pregnancy at Saigon. His investigation comprised 135 women, who were Viet-Namese, Chinese, or Cambodians. The study dealt with the effects of malaria on pregnancy, on labor, on breast feeding, and on the infant. According to the author, pregnancy seemed to favor relapses among those who were already infected. Attacks during the pregnancy seemed in general less severe in the first two trimesters. Following delivery, relapses were still more frequent and occurred most commonly about the third or fourth day after delivery. Unless associated with puerperal infection they were mild and transient. Malaria seems to tend to interrupt pregnancy; 56 per cent of the cases were miscarriages or premature deliveries. The miscarriages tended to occur during the second or third month. In most cases the premature deliveries seemed to have been provoked by an attack at the beginning of the last trimester. Labor among women with malaria was longer than in normal cases. It was observed that maternal fatigue supervened more rapidly and often required obstetrical intervention. Hemorrhage was observed rather frequently during delivery. Milk secretion was directly dependent on the general state of the patient, and above all on the febrile condition resulting from relapses during the postpartum period. Finally, Hung emphasizes that malaria is transmitted to the fetus *in utero*. All species of malarial parasites are able to pass the placental barrier. The consequences of intrauterine infection vary. The prematures have the highest mortality, while the infants born at term seem to remain well, the presence of the parasites in the blood being the only symptom of malaria.

MALARIA PROPHYLAXIS IN TANANARIVE

Mercier, chief medical officer of the municipal health department at Tananarive, discusses control of malaria by means of insecticides.[8] House spraying with insecticides began at the end of 1949 and was continued through 1950. DDT in oil was employed. As a result the year 1950 was marked by a remarkable drop in malaria deaths. In 1949, there were 357 deaths from acute malaria, and 88 due to chronic malaria. In 1950, there were 153 deaths from acute malaria, and 36 due to chronic malaria.

NATIONAL INSTITUTE OF HEALTH IN JAPAN

The Japanese National Institute of Health was created on May 21, 1947, under the jurisdiction of the Ministry of Welfare.[9] It was given the responsibility for conducting and coordinating

research projects of national importance in public health, for exercising control of biologicals and antibiotics, for acting as the national diagnostic center, and for setting standards for public health laboratories of all kinds. In addition, the National Institute of Health was selected to act as the channel through which international exchange of information or international cooperation would be carried out. The Institute publishes an *Annual Report* and the *Japanese Medical Journal*, a bimonthly magazine in English. (This has now become the *Japanese Journal of Medical Science and Biology*.)

MASS CHEST X-RAY SURVEY FOR DISTOMIASIS AND PARAGONIMIASIS

Miyake reports on a mass survey of lung fluke infestation by radiography in several districts of Kochi prefecture.[10] Out of 73 patients with pulmonary distomiasis, 66 exhibited radiologic findings (infiltrative, nodular, cystic shadows.)

Oike and his co-workers carried out a mass survey of pulmonary paragonimiasis in August, 1951.[11] In 26 cases in which eggs were present in the sputum, the following x-ray findings are reported: cystic shadows-2, nodular shadows-6, infiltrative shadows-18. Three cases were found in which tuberculosis was a complication and in these cases differential diagnosis was difficult.

A NEW METHOD FOR DIAGNOSIS OF JAPANESE B ENCEPHALITIS

Kumagai and Kurokochi report a method for making a diagnosis of Japanese B encephalitis.[12] They observed that the cerebrospinal fluid of patients with this disease contained fatty acids in quantities more than ten times greater than the fluid of normal persons. In cases of tuberculous meningitis, epidemic cerebrospinal meningitis and other diseases, the quantity of fatty acids is much less than in Japanese B encephalitis. The authors believe that the increase in fatty acid content is related to pathological changes in the brain tissue, and that a diagnosis combined perhaps with information of prognostic significance can be obtained by quantitative measurement of fatty acids in the cerebrospinal fluid.

GEOGRAPHICAL DISTRIBUTION OF NEUTRALIZING ANTIBODY AGAINST POLIOMYELITIS VIRUS IN JAPAN

A series of neutralization tests against Lansing strain polio virus were performed on specimens of serum collected in 1947–1950 from normal population groups in various parts of Japan (Hokkaido, Aomori, Tokyo, Okayama, and Kumamoto).[13] These groups numbered 121, 107, 171, 137, and 106 respectively, giving a total of 642 persons. A number of positive reactors was found all over the country. With respect to age distribution, the rate for positives in the younger age group was lower while that for the older age group was higher in all areas. Geographically, the positives rate was lower in northern areas and higher in southern areas. Tokyo, Okayama, and Kumamoto all showed high positive rates. On the other hand, the rate was lowest in Hokkaido. In view of this information, the authors presume that the distribution of polio virus decreases in a northerly direction.

IMMUNE SERUM PROPHYLAXIS IN EXPERIMENTAL RABIES

Ishii reports studies on serum prophylaxis of rabies.[14] He injected immune serum into mice. Serum prophylaxis was apparently effective up to six hours after an injection when administered intramuscularly at the site of virus inoculation. When immune serum was injected intramuscularly, at the site where the rabies virus had been inoculated, the protection produced was greater than intraperitoneal injection elsewhere in the body.

DDT-RESISTANT LICE IN TOKYO

The DDT-resistance of a group of lice in 1948 was compared with that of another group in 1951.[15] Fifty mg. DDT was dusted on a patch of blanket 3.5 cm. in diameter. In the 1948 group, the lice died in 42–54 hours at a temperature of 19° C., and in 18–30 hours at 30° C. In the 1951 group, however, it took from 4 to 6 days indicating evidence of increased DDT-resistance.

In the DDT-adaptation test of the lice in the 1948 group, 7 mg. DDT dusted on a blanket was not enough to kill all the lice, while 20 mg. DDT or more killed all the lice. In the 1951 groups, some descendants (seventh or eighth generation) of 220 adult lice were found to be DDT-resistant. Half of these survived 50 mg. DDT during 5 days observation.

REFERENCES

1. Verhaart, W. J. C. Poliomyelitis in Indonesia. *Documenta Neerlandica et Indonesica de Morbis Tropicis* 1:377–384, 1949.
2. Kouwenaar, W. Incidence of Cancer in Indonesia. *Ibid.* 3:357–367, 1951.
3. Gispen, R. The Role of Rats and Mites in the Transmission of Epidemic Scrub Typhus in Batavia. *Ibid.* 2:23–35, 1950.
4. Gispen, R., Gan, K. H., and Westermann, C. D. Endemic Typhus in Java. I. Incidence and Distribution of Shop Typhus. II. The Natural Infection of Rats and Ectoparasites: Identity of Shop Typhus and Murine Typhus. *Ibid.* 3:60–66, 155–162, 1951.
5. Luyken, R. Problems of Nutrition in Java and the Surrounding Islands, 1946–1950. *Ibid.* 3:126–137, 1951.
6. Njo-Tiong-Tjiat. Weight and Length of the Newborn in Djakarta. *Ibid.* 3:202–204, 1951.
7. Hung, Le Van. Paludisme et grossesse à Saigon. *Rev. du Paludisme* 9:75–112, 1951.
8. Mercier, Serge. La prophylaxie du paludisme au moyen des insecticides organiques de synthèse á Tananarive en 1950: incidences épidémiologiques et démographiques. *Ibid.* 10:21–31, 1952.
9. *The National Institute of Health*, Shiba-Shisokane-Daimachi Minato-Ku Toyko, Japan, 1951.
10. Miyake, Hisashi. The Mass Chest Survey of Lung-distomiasis (Part 1), *Shikoku Acta Medica* 2:10–15, 1951.
11. Oike, K., Asoda, Y., and Sirakawa, T. Mass Chest Survey of Paragonimiasis (Part 2), *Shikoku Acta Medica* 2:24–29, 1951.
12. Kumagai, K., and Kurokochi, Y. New Method of Diagnosis of Japanese B Encephalitis, *Japan. M. J.* 3:237–242, 1950.
13. Kitaoka, M., and Miura, T. Geographical Distribution of Neutralizing Antibody against Poliomyelitis Virus "Lansing" Strain on Human Sera Collected in Various Parts of Japan. *Ibid.* 4:215–221, 1951.
14. Ishii, K. Immune Serum Prophylaxis in Experimental Rabies I. Infection with Fixed Virus. *Japan. J. M. Sci. & Biol.* 5:159–170, 1952.
15. Kitaoka, M. D.D.T.-Resistant Louse in Tokyo. *Ibid.* 5:75–88, 1952.

ASSOCIATION NEWS

EIGHTY-FIRST ANNUAL MEETING
AMERICAN PUBLIC HEALTH ASSOCIATION
NEW YORK, N. Y., NOVEMBER 9–13, 1953

FELLOWSHIP IN THE AMERICAN PUBLIC HEALTH ASSOCIATION

The grade of Fellowship was established in the American Public Health Association in 1922. Professional workers in public health are eligible for election as Fellows under certain conditions and as an indication that they have achieved a recognized professional standing. As of January 1, 1953, the total membership of the Association was 12,286, including 2,814 Fellows, or almost 23 per cent of the total.

Questions are frequently asked regarding the requirements for Fellowship and the following statement outlines the provisions of the By-laws governing qualification and election.

Persons who have been members of the Association for at least two years and who have reached their 30th birthday are eligible to apply if, in their opinion, they meet the conditions of one or more of the six clauses in the By-laws defining "an established professional standing." These six possible approaches are as follows:

a. A person who has rendered acceptable service for two or more years in a responsible public health position and who has been awarded in course a degree of Doctor of Public Health, Doctor of Science in Public Health, Doctor of Philosophy in Public Health, Doctor of Medicine with at least one year of graduate study in public health in a university, Master of Public Health, Diploma in Public Health, or other equivalent degrees, according to standards approved by the Executive Board of the American Public Health Association.

b. A person who has been awarded in course an academic or professional degree involving training in public health and who has been regularly engaged in health work for at least five years, having rendered meritorious service as a health officer or in responsible charge of work in either a public or private health agency.

c. A person who has done notable original work in public health or preventive medicine of a character to give him a recognized standing.

d. A person regularly engaged in health work for at least five years, who has given evidence of special proficiency, who has attained a recognized standing.

e. A teacher of public health or one of its constituent sciences who has attained distinction as an expounder of the principles of public health or its constituent sciences. Such a teacher shall have had at least five years' experience as a teacher of public health subjects. Any years of experience as defined in paragraphs "b" and "d" that the applicant may have had shall be considered the equivalent of the same number of years' experience as a "teacher."

f. A person not covered by the above, who has made substantial contributions to public health work in his chosen branch, who has attained a recognized professional standing.

Persons wishing to apply should request a Fellowship application blank from the American Public Health Association Membership Department, 1790 Broadway, New York 19, N. Y. Appli-

cations are accepted up to August 1 each year for consideration by the Governing Council at the fall meeting. It is important to make clear that members themselves should take the initiative in submitting such applications. Neither the Sections nor the APHA administrative staff are authorized to solicit applications. This means that, although over 3,000 persons have been duly recognized with this grade of affiliation since 1922, there are other persons well qualified who have never initiated the process of applying for Fellowship. It should be clear that members should not await action by others if they wish to attain Fellowship. It is necessary and proper for them to take the first step.

An application for Fellowship requires sponsorship by two Fellows of the Section with which the applicant desires to be affiliated. These personal signatures are to be obtained by the applicant before submitting the completed application. The APHA office will assist, on request, in determining the Section with which prospective sponsors are affiliated. Applications from persons not wishing to be identified with a particular Section and requesting unaffiliated Fellowship may be sponsored by any two Fellows of the Association.

When properly sponsored and otherwise completed, the application is sent to the APHA office, after which the list of persons applying is published in the *American Journal of Public Health*, usually in the September issue, but in any case not less than 15 days before the date for the Annual Meeting. An established routine is followed for review by the Section Councils (unaffiliated applications are reviewed by the Executive Board) and by the Committee on Eligibility. This Standing Committee of the Association is made up of one Fellow from each of the 13 Sections, plus a Chairman elected by the Executive Board. This group is under instructions from the Governing Council to examine each application in accordance with the provisions of the clause of the By-laws chosen by the applicant, and to apply the criteria with precision in each case. Final election is by the Governing Council at the second meeting at each annual session.

The privileges of Fellowship include eligibility to serve as an officer of the Association or one of the Sections, Chairman of an Association or Section Committee (over one hundred in number), a member of one of the four Standing Committees, a member of the Governing Council or Executive Board, and the right to vote on amendments to the Constitution. Some Civil Service and merit system records depend upon Fellowship in the American Public Health Association as an achievement deserving recognition in applicants.

The dues of Fellows are $15.00 annually, and include a subscription to the *American Journal of Public Health* and other services to which members are eligible. Life membership is available at $200.00 covering all future annual dues.

Applications for Fellowship to be considered at the 81st Annual Meeting in New York, N. Y., November 9–13, should be filed with the Association as soon as they are completed, and in any case not later than August 1. For further information, address the Membership Department, American Public Health Association.

1953 GOVERNING COUNCIL NOMINATIONS

The Nominating Committee for APHA Elective Councilors, L. J. Peterson, Boise, Ida., chairman, reports that the following 21 Fellows of the Association have been chosen by it as nominees for the Governing Council for 1953. In submitting these names, the committee completes its assignment under Article VII, Section 1, of the By-laws. This By-law reads: "There shall be a nominating committee, to be known as the Nominating Committee for Elective Councilors, composed of one Fellow elected by each Section at the preceding annual meeting, and an additional Fellow designated by the Executive Board, the latter serving as Chairman. This Committee shall present to the Administrative Office not less than six months before the annual meeting the names of at least twenty and not more than thirty Fellows of the Association selected with due regard to geographical and membership considerations as nominees for the Governing Council."

Justin M. Andrews, Sc.D.
Public Health Service
Washington, D. C.

Richard F. Boyd, M.D.
Public Health Service
Boston, Mass.

Lester Breslow, M.D.
State Department of Public Health
Berkeley, Calif.

James P. Dixon, Jr., M.D.
National Institutes of Health
Bethesda, Md.

Thomas D. Dublin, M.D.
National Health Council
New York, N. Y.

Kenneth A. Easlick, D.D.S.
University of Michigan
Ann Arbor, Mich.

Geoffrey Edsall, M.D.
Armed Forces Epidemiological Board
Washington, D. C.

C. Howe Eller, M.D.
Louisville and Jefferson County Board of Health
Louisville, Ky.

Alfred H. Fletcher
State Department of Health
Trenton, N. J.

Rena Haig
State Department of Public Health
San Francisco, Calif.

Dorothy M. LaSalle, Ed.D.
Wayne University
Detroit, Mich.

C. Frances MacKinnon
University of North Carolina
Chapel Hill, N. C.

Malcolm H. Merrill, M.D.
State Department of Public Health
San Francisco, Calif.

Seward E. Miller, M.D.
Public Health Service
Washington, D. C.

Arthur F. W. Peart, M.D.
Department of National Health and Welfare
Ottawa, Ontario

Blucher A. Poole
State Department of Health
Indianapolis, Ind.

Guy V. Rice, M.D.
State Department of Public Health
Atlanta, Ga.

Edith P. Sappington, M.D.
U. S. Children's Bureau
San Francisco, Calif.

James H. Steele, D.V.M.
Communicable Disease Center, PHS
Atlanta, Ga.

Felix J. Underwood, M.D.
State Board of Health
Jackson, Miss.

George M. Wheatley, M.D.
Metropolitan Life Insurance Company
New York, N. Y.

The composition of the 1953 Nominating Committee is as follows: Chairman, L. J. Peterson; representing Dental Health Section, Philip E. Blackerby, D.D.S.; representing Food and Nutri-

tion Section, Bertlyn Bosley, Ph.D.; representing Health Officers Section, Harold D. Chope, M.D.; representing School Health Section, Helen L. Coops, Ph.D.; representing Maternal and Child Health Section, Edward Davens, M.D.; representing Engineering Section, Ernest G. Eggert; representing Public Health Nursing Section, Theodora A. Floyd; representing Statistics Section, F. M. Hemphill, Ph.D.; representing Medical Care Section, Margaret C. Klem; representing Public Health Education Section, Nell McKeever; representing Industrial Hygiene Section, Helmuth H. Schrenk, Ph.D.; representing Laboratory Section, Howard J. Shaughnessy, Ph.D.; and representing Epidemiology Section, James Watt, M.D.

Fellows of the Association are reminded that according to Section 3 of By-law Article VII, "upon the petition of twenty-five Fellows the Nominating Committee shall add the name of any Fellow to the nominees selected by it, provided such petition is received not less than three months before the annual meeting." The closing date for the receipt of such petitions in the APHA Administrative Office will be August 10.

The list of Governing Council nominations shown above, plus any that may be added by petition, will be carried on the official ballot that will be mailed to all members and Fellows in good standing on August 17.

NEWS OF APHA AFFILIATED SOCIETIES

Arizona

At its Annual Meeting in Yuma, April 15–18, the Arizona Public Health Association celebrated its Silver Anniversary. Subjects discussed at special sessions were Frontiers of Public Health, The Physician and Public Health, Public Health Problems of Western States, Newer Trends in Public Health Nursing, a Multi-Phasic Program—New Horizons. Sessions were also sponsored by four sections: Clerks, Nurses, Sanitarians, and Special Services. Out-of-state speakers came from California, District of Columbia, Illinois, Indiana, and New York. The 1953–1954 officers are:

President—Jefferson I. Brown, director, Public Health Nursing Division, State Department of Health, Phoenix
President-Elect—L. J. Lull, M.D., area medical director, Office of Indian Affairs, Phoenix
Vice-President—Maxine Cole, Yuma
Past-President—Frank R. Williams, director of health education, State Department of Health
Secretary—Virginia Redondo, State Department of Health
Treasurer—Emma Gupton, State Department of Health

Iowa

The Iowa Public Health Association met March 5 and 6 in Des Moines for its 26th Annual Meeting. Topics covered in some of the sessions were Poliomyelitis; Problems of an Aging Population; Iowa's Basic Health Needs and How They Can Best Be Met; The Role of the Public Health Service in Health Programs; and Coordination of City, Town, and County Public Health Services. Walter L. Bierring, M.D., state commissioner of public health, was honored by a testimonial dinner at which the featured speaker was A. J. Chesley, M.D., executive officer, Minnesota State Board of Health. The following officers, all from the State Health Department in Des Moines, were elected for the coming year:

President—Edmund G. Zimmerer, M.D., director, Division of Cancer Control
President-Elect — Stanley L. Hendricks, D.V.M., public health veterinarian
Vice-President—Mattie Brass, R.N., director, Division of Public Health Nursing
Secretary-Treasurer—L. E. Chancellor, director, Division of Vital Statistics

Kansas

The Kansas Public Health Association held its 1953 Annual Meeting jointly with the Middle States Public

Health Association, April 13–15, in Topeka. A wide range of health subjects was covered in the three-day program with public health workers from 14 states and the District of Columbia participating in the discussions. Approximately 400 persons registered. The new officers of the KPHA are:

President—Roberta E. Foote, director, Public Health Nursing Services, State Board of Health, Topeka
President-Elect—Thomas R. Hood, M.D., executive secretary, State Board of Health
Vice-President—Vernon D. Foltz, acting head, Department of Bacteriology, Kansas State College, Manhattan
Secretary-Treasurer—Evelyn Ford, secretary to director of local health services, State Board of Health

New Mexico

The 25th Annual Meeting of the New Mexico Public Health Association was held at Las Cruces, April 6 to 7. At that time the following officers were elected:

President—John C. Mitchell, M.D., district health officer, Silver City
President-Elect—Ryan Pierson, senior bacteriologist-serologist, Mobile Laboratory, State Department of Public Health, Albuquerque
Past-President—Bessie Morse, district supervisor, Bernalillo County Health Department, Albuquerque
Vice-President—Vivian R. Green, Las Cruces
Secretary-Treasurer—Mary M. Gilliland, executive assistant, Maternal and Child Health Division, State Department of Public Health, Santa Fe
Librarian—Helen M. Boss, administrative assistant, State Public Health Laboratory, Albuquerque
Delegate to Western Branch, APHA—Robert P. Lowe, associate engineer, State Department of Public Health
Representative to APHA Governing Council—Portia Irick, director, Division of Public Health Nursing, State Department of Public Health

New York

The Annual Meeting of the Public Health Association of New York City was held on February 18, 1953, under the leadership of the president, Harry S. Mustard, M.D. A Panel on Experience with Health Appraisal was directed by George Rosen, M.D., and dealt particularly with newer developments in child health and industrial medicine. The officers for the current year are:

President—Roscoe P. Kandle, M.D., associate director, Community Research Associates
Vice-President—Carl Erhardt, director, Bureau of Records and Statistics, New York City Department of Health
Secretary-Treasurer—Augusta B. King, executive secretary, Bronx Tuberculosis and Health Committee

Puerto Rico

The 12th Annual Meeting of the Puerto Rico Public Health Association was held in San Juan, February 4–7. Following are the officers for the current year:

President—Nelson Biaggi, assistant professor of sanitation, School of Medicine, University of Puerto Rico, San Juan
President-Elect—Esther Seijo de Zayas, M.D.
Vice-President—Luis Torres Aguiar, M.D., in charge of Infant Hygiene Clinics, Public Health Department, San Juan
Secretary—Josefina Maldonado, health education director, Antituberculosis Association of Puerto Rico, Santurce
Sub-Secretary—Adelaide Sanavitis
Treasurer—Carmen Acevedo de Torres, assistant professor of Health Education, School of Medicine, University of Puerto Rico
Representative to APHA Governing Council—Francisco Berio, M.D., health officer, San Juan

Texas

The Texas Public Health Association met for its 1953 Annual Meeting in Galveston, February 15–18, at which time the following persons took office:

President—Roy G. Reed, M.D., director, Victoria County Health Unit, Victoria
President-Elect—Edward F. Riedel, State Health Department, Austin
1st Vice-President—M. L. McDonald, health educator, City Health Department, Dallas

2nd Vice-President—Ella Patton, public health nurse consultant, State Health Department
Executive Secretary—Earle W. Sudderth, public health engineer, Dallas County Health Department, Dallas

MILK-FREE PLATING MEDIUM TO BE USED

The Tenth Edition of the Association's *Standard Methods for the Examination of Dairy Products* will specify a new formula of the medium used for the standard milk plate count. Dried milk is not an ingredient of the new medium, as it is of the present *Standard*. Use of the new recommended medium will become official only upon publication of the Tenth Edition. Publication is presently scheduled for late summer of 1953.

APPLICANTS FOR MEMBERSHIP

The following individuals have applied for membership in the Association. They have requested affiliation with the sections indicated.

Health Officers Section

Rodolphe L. Coigny, M.D., United Nations Hqs. Bldg., Room 2235, New York N. Y., Chief, New York Liaison Office, WHO

Charles B. Davis, Jr., M.D., M.P.H., Consolidated Board of Health, Wilmington, N. C., Health Officer

Melvin R. Davis, M.P.H., 615 N. Wolfe St., Baltimore 5, Md., Student, Johns Hopkins School of Hygiene and Public Health

Carlos Diaz del Pinal, M.D., Calle Cementerio No. 1, San Salvador, El Salvador, C. A., Director, Health Center of Sonsonate, Direccion General Sanidad

Dr. Nelson Estruch, Calle Santiago Esq. J. J. Perez, Salud Publica y Prevision Social, Dominican Republic, Undersecretary

Robert Faust, M.D., 3942 Deer Ave., Sherman Oaks, Calif., District Health Officer, Los Angeles County Health Dept.

Carl W. Hammer, M.D., M.P.H., 1021 South Grand Ave., Bozemand, Mont., Health Officer, City-County Health Dept.

Oakley R. Jones, M.D., Board of Health, Melrose, Mass., Chairman

Austin W. Matthis, M.D., 1007 Hamilton Ave., El Centro, Calif., Health Officer, Imperial County Health Dept.

Carl Norfleet, M.D., Box 224, Somerset, Ky., Director, Pulaski County Health Dept.

Nell T. Pattengale, M.D., 1103 Tyrone Blvd., St. Petersburg, Fla., Officer, Tuberculosis Control, Pinellas County Health Dept.

James F. Speers, M.D., Bellair Bldg., Room 7, Cocoa, Fla., Health Officer, Brevard-Osceola Health Unit

Julius Stone, M.D., 3902 Venable Ave., Charleston, W. Va., Director, Prevention and Control Center, Memorial Hospital, USPHS

Laboratory Section

Paul S. Anderson, Jr., Ph.D., 169 Gilbert Ave., New Haven, Conn., Sanitary Inspector, Yale Univ.

Seymour Froman, Ph.D., Olive View Sanatorium, Box 1, Olive View, Calif., Microbiologist, Los Angeles County

James R. Hendricks, Ph.D., Box 229, Chapel Hill, N. C., Asst. Professor of Parasitology, School of Public Health, Univ. of North Carolina

Carol P. Kraeger, M.S., 1404 N. Capitol St., Pekin, Ill., Director of Laboratory, Peoria City Public Health Laboratory

John E. Larsh, Jr., Sc.D., Univ. of North Carolina, School of Public Health, Chapel Hill, N. C., Head, Dept. of Parasitology

Lois H. Lindberg, 1077 Park Ave., Alameda, Calif., Public Health Bacteriologist Trainee, Division of Laboratories, State Dept. of Health

John F. Neves, 1316 Beverly Drive, Richmond, Va., Bacteriologist, State Health Laboratory

Ethel E. Quillin, 524 West "G" St., San Diego 1, Calif., Public Health Bacteriologist III, Health Dept. County of San Diego

E. R. Quortrup, D.V.M., 4005 Rosecrans, Bldg. 22, San Diego 10, Calif., Director, San Diego County Livestock Dept.

Statistics Section

Samuel H. Brooks, 615 N. Wolfe St., Baltimore 5, Md., Student, Johns Hopkins School of Hygiene and Public Health

Irwin D. J. Bross, Ph.D., Cornell University Medical College, 1700 York Ave., New York 21, N. Y., Statistical Consultant

Joseph A. Cavanaugh, Ph.D., U. S. Embassy,

Lima, Peru, S. A., Analytical Statistician and Demographer, Institute of Inter-American Affairs, USPHS

Betty L. Murray, 3612 34th St., N.W., Washington 1, D. C., Chief, Medical Service Reports Branch, Biometrics Division, Office of the Surgeon General, USAF

Edward E. Wieben, 318 Chapman St., Iowa City, Ia., Statistician, Tumor Registry, State Univ. of Iowa Hospitals

Engineering Section

Thomas B. Ard, 1770 Embassy Drive, Jacksonville, Fla., Asst. Sanitary Engineer, City Health Dept.

Jacob M. Block, 21 Sanford Place, Newark 6, N. J., Industrial Hygiene Engineer, Dept. of Health

Wayne F. Colbert, 1515 Underwood Ave., Milwaukee 13, Wis., Sanitarian, Wauwatosa City Health Dept.

William T. Cullen, 655 Plum St., Navato, Calif., Sanitarian, Marin County Health Dept.

Richard D. W. Dutton, P. O. Box 10, Fort Portal, Uganda, East Africa, Health Inspector, Medical Dept.

Carlton N. Easterling, 440 S. Beach St., Daytona Beach, Fla., Supervisor Sanitarian, Volusia County Health Unit

Stephen H. Excell, W. 1123 17th Ave., Spokane 41, Wash., Sanitarian, Spokane County Health Dept.

Louis A. Frizzi, 1009 E. Tujunga Ave., Burbank, Calif., Sanitation Inspector, Los Angeles Health Dept.

Francis J. Goldsmith, 608 Woodington Road, Baltimore 29, Md., Sanitarian Group II, Baltimore Health Dept.

Jack B. Hatlen, Jr., 4072 Union Bay Circle, Seattle 5, Wash., Lecturer in Public Health, Univ. of Washington

Melvin H. Kirschner, 1732 6th Ave., Oakland 6, Calif., Consulting Public Health Sanitarian, California Dept. of Public Health

George T. Lohmeyer, 1336 N.W. 5th Ave., Gainesville, Fla., Superintendent, Sewage Treatment Plant, Univ. of Florida

Robert P. Lowe, M.S., 1957 Kiva Road, Santa Fe, N. M., Assoc. Engineer, Division of Sanitary Engineering and Sanitation, State Dept. of Public Health

Arthur E. Marks, 20 E. Delaware Place, Chicago 11, Ill., Chief, Insect and Rat Control Section, Chicago Health Dept.

Roy J. McDonald, P. O. Box 202, Colfax, Wash., Senior Sanitarian, Whitman County Health Dept.

Richard E. Reavis, 320 Harlin Drive, West Plains, Mo., Student, Missouri School of Mines and Metallurgy

Donald L. Rodgers, Birch Road, Franklin Lakes, Box 85, Wyckoff, N. J., Sanitary Inspector 1st Grade, Board of Health

Prospero Ruiz, M.S., Ap. de Correos 622, San Salvador, El Salvador, C. A., Sanitary Engineer, Health Demonstration Area, WHO

Lee H. St. John, 954 Broadway, North, Seattle 2, Wash., Consulting Engineer

Ellis J. Stutz, 238 N. Bowling Green Way, Los Angeles 49, Calif., Student, Univ. of California at Los Angeles

Melvin L. Zabar, M.S., Board of Health, Town Hall, Needham, Mass., Sanitarian

Industrial Hygiene Section

Charles I. Barron, M.D., Lockheed Aircraft Corp., Burbank, Calif., Medical Director, California Division

Burton M. Feinsmith, M.S., 129 W. 48th St., Bayonne, N. J., Chief, Industrial Hygiene Branch, Preventive Medicine Division, Medical Section, Hqs. First Army, Governors Island, New York, N. Y.

Alice Meyers, 386 Margaret St., San Jose 12, Calif., Stenographer Clerk, Santa Clara County Health Dept.

Robert L. Morris, M.S., 1306 Keokuk, Iowa City, Ia., Chief Chemist, State Hygienic Laboratory

Food and Nutrition Section

Rita L. Coleman, M.S., 6142 S. Parkway, Chicago 37, Ill., Nutrition Consultant, Chicago Health Dept.

Marion Cornell, 500 Beverly Ave., Morgantown, W. Va., District Nutritionist, West Virginia Dept. of Health, Bureau of Nutrition

Joyce J. Crandall, M.N., 2439 Napoleon Blvd., Louisville, Ky., Nutrition Consultant, State Health Dept.

David M. Hegsted, Ph.D., 695 Huntington Ave., Boston 15, Mass., Assoc. Professor of Nutrition, Harvard School of Public Health

Mary A. Peterson, M.S., 2040 Stearns Road, Cleveland 6, Ohio, Asst. Professor, Western Reserve Univ.

Eleanor M. Sprague, M.A., Institute of Inter-American Affairs, American Embassy, San Salvador, El Salvador, C. A., Dietitian, Regional Consultant, Latin America Point IV

Mary Elizabeth Stephens, Pikeville, Tenn., Asst. Professor of Foods and Nutrition, Martin Branch, Univ. of Tennessee

Maternal and Child Health Section

William W. Belford, M.D., 420 Walnut St.,

San Diego 3, Calif., Pediatrician, Private Practice

Margaret A. Fabry, R.N., 1904 McClung St., Charleston, W. Va., Instructor, Care of Premature, State Health Dept.

Sarah T. Otto, M.S.W., 120 Marion Drive, Athens, Ga., Mental Health Consultant, State Dept. of Public Health

Helen L. Witmer, Ph.D., 433 S. Lee St., Alexandria, Va., Director, Division of Research, Children's Bureau

Public Health Education Section

Margaret Austin, M.A., 1603 W. Main, Murray, Ky., Field Representative, Division of Public Health Educaton, State Dept. of Health

Richard N. Baisden, M.A., Institute of Industrial Relations, Univ. of California, Los Angeles 24, Calif., Research Political Scientist

William E. Brandt, D.O., Philadelphia College of Osteopathy, 48th and Spruce, Philadelphia 29, Pa., Acting President

Charles C. Clark, M.S.P.H., 1705 S.W. 19th Ave., Portland, Ore., Health Educator, Multnomah County Health Dept.

Martha R. Davis, R.N., 27 Dayton St., Elizabeth, N. J., Public Health Nurse, State Dept. of Health

Mae D. Dorman, R.N., M.P.H., 4918 Kensington Drive, San Diego 16, Calif., Public Health Educator, San Diego Dept. of Public Health

James C. Gerhard, M.A., 311 Trust Company Bldg., Chambersburg, Pa., Exec. Secy., Franklin County Tuberculosis Society

J. Ray Hanna, 6856 Eastern Ave., N.W., Washington 12, D. C., Advertising Manager, *Life and Health Journal*

Frederick W. Hering, M.S.P.H., 2124 Grand Ave., Des Moines, Ia., Case-finding Coordinator, Iowa Tuberculosis and Health Assn.

Mary H. Landsrath, M.A., 4 S. Church St., Schenectady 5, N. Y., Exec. Secy., Schenectady County Tuberculosis and Health Assn.

Mildred K. Martin, Box 102, Pineville, Ky., Educationist, Division of Health Education, State Health Dept.

Leonard T. O'Neill, 19 Mechanic, Norwich, Conn., Sanitarian, Health Dept.

Marion C. Riser, Jr., M.A., M.P.H., 435 Roosevelt Drive, Tallahassee, Fla., Asst. Professor of Health Education, Florida State Univ.

Jeane M. Roth, 37 Parker Place, New Haven, Conn., Health Educator, Connecticut Cancer Society

Joe Fred Sills, M.S.P.H., 739 N. Main St., Shelbyville, Tenn., Public Health Educator, Bedford-Marshall District Health Dept.

Russell W. Stewart, 2531 Central Ave., St. Petersburg, Fla., Exec. Director, Florida Heart Assn.

Anna M. Timmons, 65 Ridge St., Glens Falls, N. Y., Exec. Secy., Warren County Tuberculosis and Health Assn.

J. T. Watson, M.S., 1303 N. Bowie, San Benito, Tex., Director of Athletics, Coordinator of Health and Physical Education, San Benito Independent School District

Public Health Nursing Section

Olive Baggallay, 8 Rue du Grand Pre, Geneva, Switzerland, Chief of Nursing Section, WHO

Thelma S. Bayard, R.N., 3324 Hogarth, Detroit 6, Mich., Consultant, Public Health Nursing Education, Detroit Dept. of Health

Elizabeth W. Brackett, M.P.H., 10 Mitchell Place, New York, N. Y., Asst. Director, Division of Medicine and Public Health, The Rockefeller Foundation

Agnes E. Chagas, M.A., 1501 New Hampshire Ave., N.W., Washington 6, D. C., Regional Nursing Adviser, WHO

Lorna W. Cushman, R.N., 3939 Duryea Ave., New York, N. Y., Acting Supervisor, Division of Family Services, Community Service Society

Edna M. DeBruler, R.N., 3812 N. Pennsylvania St., Apt. 14, Indianapolis 5, Ind., Educational Director, Nursing Service Divisions, Indianapolis Dept. of Public Health

Gladine S. Freedline, R.N., M.Litt., 740 E. State, Sharon, Pa., Nursing Arts Instructor, Sharon General Hospital, School of Nursing

Pearl O. Hinnant, R.N., 310 Duke Ave., Columbia, S. C., Supervising Nurse, Richland County Health Dept.

Enid Mathison, R.N., M.P.H., State Board of Health, Jacksonville, Fla., State Nursing Consultant

Absley McClellan, 812 Carolina Ave., Hartsville, S. C., Supervisor of Nurses, Sonoco Products Company

Eleanor C. Meserve, R.N., Box 315, Machias, Me., Public Health Nurse Supervisor, Maine Board of Health

Milton E. Muelder, Ph.D., 1133 Southlawn, East Lansing, Mich., Dean, School of Science and Arts, Michigan State College

Josephine Pedulla, 217 William St., Watertown, N. Y., Asst. Supervising Nurse, New York State Dept. of Health, Bureau of Public Health Nursing

Marian Petraske, M.P.H., 520 St. Johns Place, Riverhead, N. Y., Director of Nurses, Suffolk County Dept. of Health

Mary-Katherine Reliahan, R.N., 14 Northview Ave., Upper Montclair, N. J., Public Health Nurse, New Jersey State Dept. of Health and Township of Winfield Park

Epidemiology Section

John S. Anderson, M.D., M.P.H., 814 Greenway Court, Wichita, Kans., Medical Officer, U. S. Navy

Capt. Herbert C. Barnett, 641 Morrison Drive, Pittsburgh 16, Pa., Student, Univ. of Pittsburgh, Graduate School of Public Health

Jose Manuel Borgono-Dominguez, M.D., M.P.H., Vergara 99, Santiago, Chile, S. A., Chief, Epidemiology Section, National Health Service

Israel Live, V.M.D., Ph.D., Univ. of Pennsylvania, School of Veterinary Medicine, Philadelphia 4, Pa., Assoc. Professor of Bacteriology

Maynard H. Mires, Jr., M.D., 2 Colchester Ave., Burlington, Vt., Director, Division of Communicable Disease Control, State Dept. of Health

School Health Section

Lillian F. Bernhagen, R.N., 1786 Northwest Blvd., Columbus 12, Ohio, Coordinator of Health Services, Worthington Board of Education

Harry K. Dillard, M.D., 2101 Maryland Ave., Louisville 5, Ky., Director of Division of School Health, State Dept. of Health

Vera Mowbray, 4354 Santa Monica, San Diego 7, Calif., Supervising Nurse, Dept. of Health Education

Elsa Schneider, M.S., Dept. of Health, Education and Welfare, Office of Education, Washington 25, D. C., Specialist for Health Instruction and Physical Education

Lorena Thorup, R.N., 1412 Virginia Way, La Jolla, Calif., Coordinator, Health Education Dept., San Diego City Schools

Dental Health Section

Barnet Wachs, D.D.S., 2098 Ryer Ave., New York, N. Y., Senior Dentist, Bureau of Dental Health, New York State Health Dept.

Medical Care Section

Herbert Borchardt, D.D.S., 1741 Park Road, N.W., Washington 10, D. C., Information and Editorial Specialist, Division of Occupational Health, USPHS

George E. Cartmill, Jr., M.S., Harper Hospital, Detroit 1, Mich., Director

Mrs. Mary W. Collier, M.S.W., State Health Dept., Atlanta, Ga., Senior Medical Social Consultant

Claudia Crownover, Riverview Terrace, Apt. 305, Charleston, W. Va., Nursing Consultant, UMWA, Welfare and Retirement Fund

Michael M. Dacso, M.D., Goldwater Memorial Hospital, Welfare Island, New York 17, N. Y., Director, Dept. of Physical Medicine and Rehabilitation

Carmella A. Gonnella, Gonzales Warm Springs Foundation, Gonzales, Tex., Asst. Director, Physical Therapy Dept.

Margaret G. Holden, M.S., RFD 1, Box 120-C, Dundee, Ill., Supervisor, Medical Social Training Project, Univ. of Illinois, Division of Services for Crippled Children

Clarence L. Jackson, Jr., M.A., M.H.A., Colorado General Hospital, Denver 20, Colo., Administrative Resident, Univ. of Colorado Hospitals

Renato M. Malan, M.D., D.P.H., Regional Office for Europe, WHO, Geneva, Switzerland, Regional Health Officer, Social Medicine and Occupational Health

Augusta A. Montague, M.S., 33 Myrtle Court, Augusta, Ga., District Medical Social Consultant, State Health Dept., Crippled Children Division

Albert R. Monti, Ph.B., 3549 Fremont St., Rockford, Ill., Comptroller and Public Relations Director, Illinois Hospital Service, Inc.

John A. Nelson, M.A., Cleveland Hospital Service Assn., 2060 E. 9th, Cleveland 15, Ohio, Asst. Director, Hospital Relations

William J. Reidy, 2531 Hampton Road, Rocky River 16, Ohio, Asst. Director, Cleveland Hospital Service Assn.

Michael Rodzenko, M.A., The Malden Hospital, Malden, Mass., Administrative Resident

Alexander S. Sebo, M.D., 2590 Frisby Ave., New York 61, N. Y., Medical Director, East Bronx Medical Group

Arthur L. Stern, 361 Wortman Ave., Brooklyn, N. Y., Asst. Director, The Long Island Jewish Hospital

I. Marshall Whisnant, Jr., Atlantic, N. C., Administrator, Sealevel Community Hospital

Frederick A. Whitehouse, Ed.D., 99 Lenox Ave., Lynbrook, N. Y., Rehabilitation Consultant, American Heart Assn.

Unaffiliated

A. David Bouterse, M.A., 1 N. 13th St., Philadelphia 7, Pa., Exec. Director, Pennsylvania Mental Health, Inc.

Ekesekwu R. Dallah, 229 Putnam Ave., Brooklyn, N. Y., Student, Columbia Univ., School of Public Health

Helen Daniels, 615 N. Alabama St., Indianapolis, Ind., Secretary, Health Division, Health and Welfare Council of Indianapolis and Marion County, Inc.

Jack M. Kuehne, 626 Potrero Ave., San Francisco 10, Calif., Manager, Rose Exterminator Company

Howard A. Prentice, Ed.D., 1001 Connecticut Ave., N.W., Room 919, Washington, D. C., Vice-President, Corn Industries Research Foundation, Inc.

Victor Schoch, 5100 Arcade Bldg., Seattle, Wash., Exec. Director, Washington State Heart Assn.

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HOTEL RATES

81ST ANNUAL MEETING

NEW YORK, N. Y., NOVEMBER 9–13, 1953

The form below is for your convenience in making hotel reservations. Please mail directly to the hotel of your choice. Those listed are West Side hotels holding rooms for Association delegates. The Statler and New Yorker are headquarters.

Hotel	*Address*	*Single*	*Double*	*Twin-Bedded*
Governor Clinton	7th Avenue & 31 Street	$5.50– 7.00	$7.50–10.00	$9.50–12.00
Henry Hudson	353 West 57 Street	4.00– 6.00	7.00–11.00	8.00–12.00
McAlpin	Broadway & 34 Street	5.00– 9.00	8.00–13.00	9.00–13.00
New Yorker	8th Avenue & 34 Street	5.00– 9.00	8.50–15.00	9.50–16.00
Statler	7th Avenue & 32 Street	5.50–10.00	8.50–12.00	9.50–17.00
Taft	7th Avenue & 50 Street	5.00– 7.75	9.75–10.75	10.50–11.50

Rates subject to 5% New York City Occupancy Tax

HOTEL RESERVATION FORM

AMERICAN PUBLIC HEALTH ASSOCIATION

81ST ANNUAL MEETING AND MEETINGS OF RELATED ORGANIZATIONS

NOVEMBER 9–13, 1953

PLEASE RESERVE:

Single Room with Bath at $..... per day

Double Room with Bath at $..... per day

Twin-bedded Room with Bath at $..... per day

Arrival: November ..... Hour ..... Departing: November ..... Hour .....

NAMES OF ALL OCCUPANTS: ***ADDRESSES:***

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MAIL CONFIRMATION TO: Signed: .....

Address: .....
City Zone State

MAIL THE FORM TO THE HOTEL OF YOUR CHOICE

EMPLOYMENT SERVICE

The following pages present information for those seeking qualified public health personnel and for those seeking positions in public health.

This is a service of the Association conducted without expense to the employer or employee.

POSITIONS AVAILABLE

Assistant Health Officer—To help develop a broad, complete child health program in a three-county district health unit with population of 48,000. Experience in public health or pediatrics desirable. Salary $800–$850 per month, plus travel allowance. Donald A. Cowan, M.D., Director of Chippewa-Luce-Mackinac Health Unit, Sault Ste. Marie, Mich.

Medical Health Officer—for Shelby-Effingham County Health Department. Central Illinois location; good schools; excellent rural communities. Salary range: $6,900–$9,000; may start above minimum; must have capacity for good public relations. Mr. J. H. Griffin, Teutopolis, Ill., or Dr. O. G. Kauder, Findlay, Ill.

Public Health Physician as Health Officer—for established county health department of 37,000 in northwestern Illinois. $7,200–$9,000, plus travel allowance. Qualified physician may start above the minimum. President, Lee County Board of Health, 123 E. First St., Dixon, Ill.

Health Officer — Champaign - Urbana Public Health District, a bi-township health department serving a population of 58,385. University town, excellent schools. Tentative salary $8,500. **Health Officer**—Berwyn Public Health District. Population 52,500. Modern health center building. Entirely residential suburban community 10 miles west of Chicago; city zoned, nonindustrial. Automobile furnished. Full-time position. Salary range: $11,000–$15,000. Roland R. Cross, M.D., Director, Illinois Dept. of Public Health, Springfield, Ill.

Regional Medical Director — Annual salary $11,000. To supervise local health departments, covering 40 counties in Kentucky. Previous experience as a local health officer required. Bruce Underwood, M.D., Commissioner of Health, Kentucky State Dept. of Health, 620 S. Third St., Louisville 2, Ky.

Assistant Health Officer—salary $696–$816. **Public Health Dentist** — salary $595–$734. For progressive public health department with staff of 100 serving a community of 200,000 people in the San Francisco Bay Area. Training and experience, or both, and license to practice in California essential. James C. Malcolm, M.D., Health Officer, Alameda County Health Dept., 576 Callan Ave., San Leandro, Calif.

Associate Laboratory Director—for city health department laboratory. Graduate of approved medical school, with special knowledge of diagnostic bacteriology, serology, chemistry, and experience in administration. Salary depends on qualifications and experience. Herbert R. Morgan, M.D., Director, Rochester Health Bureau Laboratories, Strong Memorial Hospital, Rochester 20, N. Y.

Senior Bacteriologist—for state laboratory position. Minimum requirements: Bachelor's degree in bacteriology, plus three years' progressively responsible experience as public health bacteriologist. Excellent working conditions. Salary $322–$394. A. T. Johnson, Personnel Director, Oregon State Board of Health, P. O. Box 231, Portland, Ore.

Public Health Veterinarian—as assistant chief of veterinary public health services, Department of Health and Hospitals, Denver. Requires two or more years of experience in public health or a combination of public health with research, teaching, or practice. Must have ability and knowledge to supervise activities in broad veterinary public health program. Requires Colorado license or ability to obtain one. Seven cents per mile for use of car. Salary open, dependent on qualifications. Submit picture with complete qualifications and statement of salary desired. Chief Veterinary Public Health Services, 659 Cherokee St., Denver, Colo.

Sanitary Engineers—to work in California state public health program of water supply, waste disposal, and vector control. Opportunity for advancement. Two years' experience, including at least one in sanitary or public health engineering, and college degree. Civil or chemical engineering experience or training applicable. Salary starts at $395; periodic raises to

$481. Recruitment Section, State Personnel Board, 1015 L St., Sacramento 14, Calif.

Senior Pathologist—to perform highly technical and complex work in pathology in several departments of New York State. Salary range: $6,801–$8,231. Minimum qualifications are as follows: (1) M.D. from recognized medical school and completion of satisfactory internship; (2) New York State license or eligibility for one; (3) two years of training and experience in pathology, chemistry, bacteriology, and other allied subjects subsequent to graduation from medical school. **Associate Pathologist**—to carry out diagnostic work in pathology in the Division of Laboratories and Research, or to have responsible charge of a recognized laboratory in various institutions of the Department of Health in New York State. Salary range: $8,350–$10,138. Minimum qualifications are as follows: (1) M.D. from a recognized medical school and completion of a satisfactory internship; (2) New York State license or eligibility for one; (3) four years of satisfactory training and experience in pathologic work, including the diagnosis of neoplastic diseases, which must meet the standards set up by the New York State Public Health Council. This examination is open to noncitizens. **Director of Clinical Laboratories**—to direct and be responsible for all the activities of an approved hospital laboratory in institutions of the New York State Department of Mental Hygiene. Salary range: $10,138–$11,925. Minimum qualifications are as follows: (1) M.D. from a recognized medical school; (2) New York State license or eligibility for one; (3) either four years of satisfactory training and experience in pathological and bacteriological work approved by the New York State Public Health Council of which one year must have been in the diagnosis of neoplastic diseases, or a satisfactory equivalent combination of the foregoing training and experience. Applications for these positions will be issued and received continuously until further notice. No written test will be required. Write: Examinations Division, New York State Department of Civil Service, 39 Columbia St., Albany, N. Y.

Supervisor of Nurses—for generalized program, but special emphasis on child health. Salary $4,500 with mileage allowance. Must have public health degree. **Staff Nurses**—generalized public health program with emphasis on developing child health program. Must have one year of public health training in accredited school. Starting salary $3,600 per year, plus mileage; liberal personnel policies. Write Donald A. Cowan, M.D., Director, Chippewa-Luce-Mackinac Health Unit, Sault Ste. Marie, Mich.

Public Health Nurse—with certificate, for a generalized program in both urban and rural communities of the San Francisco Bay Area. Salary $306–$375. Director of Public Health Nursing, Alameda County Health Dept., 576 Callan Ave., San Leandro, Calif.

Certified Public Health Nurse—for generalized program in a county of 37,000; 100 miles west of Chicago. Car essential. $235–$300 per month with travel allowance of $65, three weeks' vacation. President, Lee County Board of Health, 123 E. First St., Dixon, Ill.

Public Health Nurse—Duty with Bureau of Indian Affairs, west of Mississippi or in Alaska. Completion of nursing course in approved school of nursing and current registration in some state are required. Age limit 50 years. No written examination. $4,205. Apply any Board of Civil Service Examiners.

Public Health Nurses—for staff positions in general public health program in southeastern Michigan. Near two large university public health nursing teaching centers. Salary based on experience and training. Automobile required. Director, Macomb County Health Dept., County Bldg., Mt. Clemens, Mich.

Public Health Nurse—Division hospital and related services, Wisconsin State Board of Health. $250 month, plus $65 cost of living bonus. Required: approved academic course in public health nursing carrying academic credit or hospital supervisory experience. Registration or eligibility in Wisconsin. Duties include supervision of maternity departments of general hospitals and nursing homes. Henry A. Kjentvet, Administrative Officer, State Board of Health, Madison 2, Wis.

Public Health Nurse—for generalized program in small rural county. Beginning salary $319. Registered nurse and public health nursing certificates required. Car optional. R. L. Hull, M.D., San Benito County Health Dept., Hollister, Calif.

Public Health Nurses—for generalized public health nursing program including school nursing. Rural and urban areas in a northern California health department. Expansion of services has created vacancies for three public health nurses and a

clinic nurse. Public health nurse salary range $298–$370, depending upon experience and qualifications. One or two qualified registered nurses can be started on a junior public health nurse rating. Junior public health nurse salary range $268–$332. County car furnished or 8 cents per mile. Richard C. Murphy, M.D., Butte County Health Dept., 2430 Bird St., Oroville, Calif.

POSITIONS WANTED

Public Health Engineer (Sanitary)—B.S., P.H. Eng., M.P.H. Registered as sanitary engineer; seven and one-half years' experience, mostly with state department of health. Married. Desires position as chief of sanitation section of fairly large city, county, or district office of state department of health. California or Southwest preferred. **Box E-21**, Employment Service, APHA.

Health Educator—M.P.H., Ed.M. Desires position in public health education field at county or state level. Experience in public health, school health, and teaching areas. **HE-55**, Employment Service, APHA.

Parasitologist - Bacteriologist—37 years old, B.S. in medical biology, M.S. in bacteriology, Ph.D. in parasitology; 53 scientific publications; experience: 2 years' public health laboratory; 7 years' hospital laboratory; 5 years' research institute; 2 years' full-time and 2 years' part-time teacher in medical schools; more than one year tropical experience, available for position in the United States or abroad by September 1, 1953. **L-27**, Employment Service, APHA.

Medical Health Officer — Education: B.A., M.P.H., M.D. Certified: American Board of Preventive Medicine. Experience: county health officer, 10 years; city health officer, 6 years. Seeks position as administrator of well staffed city or county health department. **PH-36**, Employment Service, APHA.

Sanitarian—B.A. in zoology, University of Kansas, 1951. Age 29, married. Two years' experience in milk sanitation with a local health department in a city of 100,000 population. **S-18**, Employment Service, APHA.

Statistician—seeks position in public or voluntary health agency. Three years of high level generalized experience in a large state health department. M.P.H. **ST-7**, Employment Service, APHA.

All communications on the following advertisements should be sent to Burneice Larson, Medical Bureau, Palmolive Building, Chicago 11, Ill.

WANTED OPPORTUNITIES: (a) Public health physician; Diplomate; twelve years' administrative experience. (b) PH nursing administrator; A.B., M.P.H.; seven years, supervisor, city health department. (c) Health educator; M.S., D.P.H., Ed.D.; five years, associate professor, public health; seven years, director health department, state associate professor, public health. (d) PH nurse to direct outpatient clinic, 250-bed hospital; $6,000. Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

WANTED: (a) Public health physician to serve as medical consultant; major philanthropic organization. (b) Associate professor, preventive medicine and public health; university medical school; $10,000. (c) Director, direct preventive health division, city health department; $12,000–$15,000. (d) Chief, public health nursing department, qualified to reorganize and direct metropolitan department of nursing; $7,200–$8,350; East. (e) Assistant professor public health nursing; four-year program; eastern university. (f) Health educator; faculty appointment; five years' teaching required. (g) Health educator; welfare council serving population of 850,000; $5,000. (h) Sanitary engineer; teaching post; West. Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

NEWS FROM THE FIELD

WHO NEWS

Brock Chisholm Makes Final Report

In his final annual review as director general, Brock Chisholm, M.D., reported that in 1952 WHO had given aid to 115 countries and territories. This aid was given with a regular budget of $7,700,000 and an additional $5,700,000 available from the special fund for technical assistance and the specialized agencies.

The report stresses the direct relationship between health standards and social and economic development. Unless improvements in health go hand in hand with improvements in working conditions, housing, education, agricultural and industrial productivity, they are likely to be ephemeral and piecemeal.

The report is in two parts: I, dealing with WHO work in communicable diseases, tuberculosis research, strengthening of national health administrations, education and training, epidemiological and statistical services, and a number of others; II, a survey outlining specific projects carried on through the six regional offices, often in cooperation with UNICEF.

Committee Report on Hepatitis

The Third World Health Assembly in 1951 provided for an Expert Committee to meet in 1952 "to consider the problems of epidemic and serum hepatitis and to make relevant recommendations." This Expert Committee met in Liège in July, 1952. The report of the seven-man committee has now been published as *WHO Technical Report Series No. 62*.

The introduction describes the report as an "attempt to assemble briefly the available information on the epidemiological and public health aspects of those forms of virus hepatitis now designated as 'infectious hepatitis' and 'serum hepatitis.'" Among the recommendations made by the committee "is a simple follow-up system to detect cases of serum hepatitis following administration of blood and blood products," particularly in countries in which the disease is believed to be uncommon, with a view to estimating its true incidence. Recommendations are also made to insure the safety of medical procedures involving parenteral penetration. Virus laboratory research, epidemiological observations, and clinical investigations are indicated as the most urgent research projects.

J. R. Paul, M.D., professor of preventive medicine, Yale University School of Medicine, is chairman of the committee, and W. P. Havens, M.D., associate professor of medicine, Jefferson Medical College, is a second member from the United States.

Columbia University Press, International Documents Service, 2960 Broadway, New York 27; 20¢.

A UNICEF News Bulletin

News of the World's Children is a new bimonthly bulletin of UNICEF in which are reprinted from the larger UN monthly *News Bulletin* items about UNICEF activities in behalf of children in many parts of the world. Vol. 1, No. 3, April, 1953, for example, tells mostly in pictures, how BCG reached Turkey's countryside and how a Bolivian family learned about DDT. Also included in this are stories of India's BCG campaign and how health is being brought to children of Latin American villages. Following UNICEF help in a Brazilian village, a local priest said "the

church bell used to toll the death of a baby three or four times a day; now it tolls only three or four times a month." United Nations International Children's Emergency Fund, United Nations, New York.

HARVARD TO STUDY HEALTH OF AGING

A study of the problem of the diseases, accidents, and social adjustments of older persons is made possible through a grant to the Harvard School of Public Health by the W. K. Kellogg Foundation. The grant is being used to establish a small unit within the school whose first concern will be to view geriatric problems as a whole. Studies in various departments of the school and integrated teaching in the curriculum will then be suggested.

In reporting the three year grant the dean of the school, James S. Simmons, M.D., said that presently diseases of old age are largely approached piecemeal—cancer by one group, heart disease by another, and on through the gamut of separate conditions. Social problems of the aged have been approached similarly. The study will try to fit together present work in geriatrics and the social sciences and suggest new research and service approaches. It is hoped to prove the value of discarding the fragmentary approach in favor of a broad attack on all the problems of old age.

Hugh Leavell, M.D., head of the school's Department of Public Health Practice and president-elect of the American Public Health Association, is chairman of the faculty group exploring health, welfare, recreation, employment opportunities, and political problems of the aged.

FIFTH WORLD HEALTH ASSEMBLY DELEGATION

Leonard A Scheele, Surgeon General of the U. S. Public Health Service, was chairman of the United States delegation to the 6th World Health Assembly which met in Geneva, May 5–23. Other members of the delegation were:

Leonard W. Larsen, M.D., practicing physician of Bismarck, N. D.

Franklin D. Murphy, M.D., chancellor, University of Kansas, Lawrence

Alternates were:

Frederick J. Brady, M.D., National Institutes of Health

Henry Van Zile Hyde, M.D., chief, Division of International Health, U. S. Public Health Service

Howard B. Calderwood, U. S. Department of State

Among the team of 8 advisers were:

Carl Neupert, M.D., health officer of Wisconsin and president, Association of State and Territorial Health Officers

Ruth Sleeper, R.N., president, American Nurses' Association

Col. Tom F. Whayne, chief, Preventive Medicine, Office of the Surgeon General, U. S. Army

SOCIAL RESEARCH AND TUBERCULOSIS

At its February meeting the Board of Directors of the National Tuberculosis Association authorized the creation of a Division of Social Research. The division provides consultation service to tuberculosis associations that wish to conduct social studies. In the division also are included the statistical services hitherto and continuing to be furnished by the association. The director of the new research division is William B. Tollen, Ph.D., former chief of the Administrative Statistics Section, Department of Medicine and Surgery, Veterans Administration. He will begin work with the association on July 1, 1953.

The decision to create a research division grew out of the recommendations of a Committee on Social and Economic Problems which for two years had been studying these problems as they affect tuberculosis control. It was found that at the time of diagnosis and throughout treatment, hospitalization, and convalescence practically all tuber-

culosis patients and their families are confronted by social and economic problems—chiefly personal, emotional, and family problems, financial troubles, and laws and regulations. The committee report is summarized in the *NTA Bulletin* for December, 1952.

DEWEES SCHOLARSHIP ESTABLISHED

The Pennsylvania Tuberculosis and Health Society has established an annual $2,000 Arthur Markley Dewees Scholarship for advanced study of public health in recognition of the services of Mr. Dewees as executive secretary of the society from 1919 to 1952. The scholarship is to be awarded to a Pennsylvanian for a year of graduate study in an accredited school of public health leading to a Master's Degree or in any recognized graduate school offering a curriculum designed to prepare a student for administrative or other professional service in tuberculosis or other public health work.

The announcement was made at the society's recent annual meeting at Buck Hill Falls. An engrossed resolution of the board referred to Mr. Dewees as "Administrator—Wise Counselor—Friend." Freas B. Snyder is secretary of the board and chairman of the Scholarship Committee.

INTERAMERICAN MEDICAL EDUCATION

The Interamerican Foundation for Postgraduate Medical Education has been organized to encourage exchange of educators, postgraduate students, and research workers in medicine and allied sciences in Latin and North American countries. Commercial firms in North America, a number of which have supported postgraduate training fellowships for Latin Americans, are supporting the program. Committees of medical educators in each Latin American country assume responsibility for nominating fellowship candidates.

George M. Guest, M.D., of Cincinnati, Ohio, is president of the foundation. Among its 12 physicians and one lay member of its Board of Directors are Drs. George Lull and Jay Arthur Myers. Among its advisers are Drs. Gaylord Anderson and E. H. Christopherson. The executive director is Alberto Chattas, M.D., of Argentina. Headquarters are at 112 E. Chestnut St., Chicago 11.

NUTRITION CLINIC FOR PHILADELPHIA

The Fife-Hamill Memorial Health Center of Philadelphia recently organized the first public health nutrition clinic in the city. In addition to dealing with problems of public health nutrition and nutrition education, the new clinic offers specialized consultation services to private practitioners for cases presenting nutritional problems. It will act in a consultant capacity for the Division of Medical Services of the Board of Public Education. For the first time in Philadelphia the Health Center is offering also an inservice training course in nutrition designed primarily for teachers, nurses, and other professional workers.

The physician-in-charge of the clinic is Stanley A. Tauber, M.D., a former officer of the U. S. Public Health Service, who has had public health nutrition experience under Norman Jolliffe, M.D., director of the Bureau of Nutrition, New York City Health Department. In this city the first health department nutrition clinic was established in 1949.

BRITISH SOCIETY CHANGES ITS NAME

The Society of Medical Officers of Health, Great Britain, which was founded in 1856, has changed its name to The Society of Preventive Medicine. This change followed analysis of the membership of about 2,000 which showed that only about one-fourth were medical officers of health. The largest group in fact was made up of departmental medical officers. In reporting

the change the executive secretary, G. L. C. Elliston, said, "It is clearly apparent that a common interest in health and prevention of disease is a more important factor in the membership than is the accident of the particular type of post held by the individual."

TROPICAL RESEARCH PLAN FOR LIBERIA

The Liberian Institute of the American Foundation for Tropical Medicine has initiated a program of research in tropical medicine and health problems in Liberia. Dr. Max J. Miller, former associate professor, Institute of Parasitology, McGill University, in March left for Harbel, Liberia, to become research director of the institute. The immediate objective is to investigate the prevalence and importance of tropical diseases in Liberia as a basis for carrying out a vigorous program for their control and eradication.

It is planned that in time the institute shall become an international center for research in three basic problems that have retarded development of tropical countries; diseases of man, diseases of domestic animals, and production of balanced food crops for both man and animals.

The Liberian Institute was established by the foundation in 1946 in order to stimulate tropical disease research. The Liberian government donated the land; laboratory, administration, and residential buildings were provided through a gift of $250,000 by Harvey S. Firestone, Jr., as a memorial to his father.

KIMBLE METHODOLOGY RESEARCH AWARD

The Conference of State and Provincial Public Health Laboratory Directors invites nominations of candidates for the second annual Kimble Methodology Research Award, to be presented at the next annual meeting of the conference. The 1952 award was presented at the March, 1953, meeting of the Laboratory Directors to Ad Harris, assistant director in charge of the serology section of the U. S. Public Health Service's Venereal Disease Research Laboratory at Chamblee, Georgia. The award consists of $500 and a silver plaque. The Kimble Glass Company, which established the award, provides the expenses of the candidate selected for attending the meeting.

The work of a nominee must represent a fundamental contribution that "serves as a baseline for development of diagnostic methods that fall within the province of the public health laboratory" or adaptation of a fundamental contribution for use in a diagnostic laboratory and must have been completed later than January 1, 1948.

Nominations for 1953 must be received by June 30 but later nominations will be considered for 1954. Nomination blanks and rules from: Dr. F. C. Lawler, Vermont Department of Health, 2 Colchester Avenue, Burlington, Vt., or Dr. Henry Bauer, Minnesota Department of Health, University Campus, Minneapolis 14, Minn.

MANUAL FOR ARTHRITIS CLINICS

The Arthritis and Rheumatism Foundation, in cooperation with the National Institute of Arthritis and Metabolic Diseases, has published a *Manual for Arthritis Clinics* for the use of physicians. Prepared by a Committee of Physicians, the *Manual* was designed to assist in the establishment and conduct of arthritis clinics. Arthritis and Rheumatism Foundation, 23 West 45th Street, New York 36; 50¢.

REVISED MILK ORDINANCE

Milk Ordinance and Code—1953 Recommendations of the Public Health Service is the second edition of a recommended milk ordinance originally published in 1939. The *Ordinance* is now in effect in 34 states, and in 397 counties and 1,550 municipalities of the re-

maining states. The volume is in four parts: Short Enabling Form, the Milk Ordinance, the Code, and Appendixes. Among the most important of the numerous changes in the *Ordinance* since 1939 is a provision making pasteurization mandatory.

This new edition of the *Code* includes many of the findings of the recent publication of the National Academy of Sciences—National Research Council, *Sanitary Milk Control and its Relation to the Sanitary, Nutritive, and Other Qualities of Milk*, which will be reviewed in a later issue of this *Journal*.

The revised *Code* is available from the Gov. Printing Office, Washington, D. C.; 75¢.

NEW METHOD OF TUBERCULOSIS CONTROL

Through a program of large-scale ambulatory and home treatment, the New York City Departments of Health, Hospitals, and Welfare are undertaking a coordinated attack on tuberculosis in that city. The ambulatory treatment program, making extensive use of isoniazid, is focused on those who are awaiting admission to hospitals, most of whom now wait four or more months for admission and have heretofore had little treatment during the waiting period; those who have been discharged to clinics for continued treatment; and those who refuse prolonged hospitalization. The program is designed to continue a decrease in the importance of tuberculosis within the limitations of facilities and services now available. It is also being attempted within present department budgets.

Director of the program is Arthur B. Robins, M.D., director of the Health Department's Bureau of Tuberculosis. General supervision is under the Inter-Departmental Health Council made up of the three commissioners and established by the Mayor to integrate related activities of the departments.

THE FOOD AND AGRICULTURE WORLD

The Food and Agricultural Administration in March began publication of the monthly *FAO Memo*. The main article of the first issue, "Some Things That Need To Be Said," by FAO director-general, Norris E. Dodd, defined the organization as "a world cooperative for farm know-how." The director-general thinks of FAO as cooperating with rather than being an operating arm of UN, just as the U. S. Department of Agriculture cooperates with but is not an arm of the Department of State. Requests for *FAO Memo* should be sent to: Secretary, Interagency FAO Committee, Foreign Agricultural Service, U. S. Department of Agriculture, Washington 25, D. C.

NEW DIVISION IN HEART ASSOCIATION

The Board of Directors of the American Heart Association has created a Council on Community Service and Education. This council will have the same responsibility for developing community service and community education that the Scientific Council exercises in the research and professional education fields. In line with this new council the Public Health Division has changed its name to the Community Service and Education Division, retaining John W. Ferree, M.D., as division director.

NEW HEADQUARTERS FOR COLUMBUS

Early in May the Columbus (Ohio) Department of Health moved into its new quarters, the Health and Safety Center, representing an addition to the city's Civic Center. Plans for the building and provision for future expansion are based on a projected population of three quarters of a million persons or nearly double the present population. The new Health and Safety Center houses all the divisions of the department, includes an auditorium seating 200, and provides space for the Tuber-

culosis Clinic, the Board of Industrial Relations, Civil Defense headquarters, and the Smoke Control Division of the city's Safety Department.

HEALTH PROGRAM IN A SMALL PLANT

An example of health supervision in a small industrial plant is now in operation in Cincinnati, established at the Weber Engineered Products as a result of planning carried out in cooperation with the Academy of Medicine and the Bureau of Industrial Health of the Cincinnati Health Department. A registered nurse is in attendance at the full-time plant dispensary, and a Cincinnati physician, appointed as medical director, visits the plant on a regular schedule.

Plant health services to the 140 employees include:

1. Pre-placement physical examination for most suitable work assignment
2. Voluntary and confidential periodic physical examinations with referral to worker's private physician for any abnormal conditions found
3. Immediate attention to injuries or illnesses occurring on the job
4. Frequent plant inspections for safety, sanitation, and good hygienic conditions
5. Health education and health counseling for employees, in cooperation with the family physician.

SALEM SURVEYS ITSELF

Salem, Mass., has recently completed a self-survey using the *Evaluation Schedule* of the APHA as a guide. After several months' work by a Study Committee a comprehensive report was submitted to the Salem Community Council which adopted the report and made plans to correlate all health activities. The recommendations contained special emphasis on psychiatric services, dental service, and particular problems of housing and sanitation.

MEDICAL SCHOOL GRADUATES TO ARMY

Of the more than 6,000 graduates of the nation's medical schools in 1953, 150 have been approved for the Army's Medical Intern Program. They will spend their first year out of school in rotating internships provided by the Army's 11 large teaching hospitals. The young doctors will be commissioned and called into active duty as First Lieutenants in the Medical Corps Army Reserve.

WALTER REED SOCIETY OFFICERS

At its annual meeting in Chicago on April 8 the Walter Reed Society elected the following physicians as new officers:

President: Max S. Sadove, head, Department of Anesthesia, University of Illinois

Vice-Presidents: Charles F. Code, professor of physiology, Mayo Foundation, University of Minnesota, Minneapolis

Clinton H. Thienes, director, Huntington Memorial Hospital, Pasadena, Calif.

Y. T. Oester, head of pharmacology, Stritch Medical School, Loyola University, New Orleans, La.

Secretary-Treasurer: Frances A. Hellebrandt, director, Department of Physical Medicine and Rehabilitation, University of Illinois, Chicago

Also elected were 10 directors at large, including Drs. Anton J. Carlson and Thomas H. Rivers. The Walter Reed Society is made up of persons who have served as voluntary subjects for experimental research.

PERSONALS

WADE ARNOLD, executive producer of the National Broadcasting Company, has been given the first annual Howard W. Blakeslee Award of $1,000 for outstanding scientific reporting in the cardiovascular field by the American Heart Association for the radio program "Only One To A Customer."

JOHN C. AYRES, M.D.,* former director of the Division of Alcoholism, Massachusetts Department of Public Health, is now health commissioner of Springfield, Mass.

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* Fellow.
† Member.

PARKE M. BANTA, member of the 80th Congress from the Eighth District of Missouri and practicing attorney, Ironton, has been appointed general counsel of the new federal Department of Health, Education, and Welfare, succeeding ALANSON W. WILLCOX, who has been principal attorney and later general counsel of the Federal Security Agency since 1947 and was assistant counsel general between 1939 and 1947.

LEE R. BROWN,† formerly field consultant, Connecticut Tuberculosis Association, is now assistant executive secretary of the Bronx Tuberculosis and Health Committee of the New York Tuberculosis and Health Association.

WILLIAM A. BRUMFIELD, JR., M.D.,* first deputy commissioner of health, New York State, has been appointed professor and chairman of the Department of Public Health and Preventive Medicine, State University of New York, College of Medicine, Syracuse.

BAILEY B. BURRITT,† Yonkers, N. Y., received the William Freeman Snow Medal from the American Social Hygiene Association at the Annual Social Hygiene Day luncheon meeting in New York on April 22.

JAMES J. CORBALIS, JR.,† former sanitary engineer of Fairfax County, has been appointed engineer-director of the newly created Sanitation Authority of Alexandria, Va.

MARTIN M. CUMMINGS, M.D.,† former chief, Tuberculosis Research Laboratory, Lawson VA Hospital in Chamblee, Ga., has been appointed chief of the research division, Department of Medicine and Surgery of the Veterans Administration, Washington, D. C.

WARD DARLEY, M.D., formerly dean of the University of Colorado School of Medicine, Denver, has been appointed president of the University of Colorado, Boulder.

E. A. DAVIS, M.D., of Charleston, W. Va., and MARVIN BLOCK, M.D., of Buffalo, N. Y., at the fifth annual meeting of the American Academy of General Practice in St. Louis in March were presented the awards of the M & R Laboratories for the two most significant articles to appear in the journal *GP* during 1952, for the papers, respectively, "The Art of Ethics of Medicine," and "Alcoholism, the Physician's Duty."

MARION ELLINGWOOD, R.N., formerly clinical instructor, Memorial Hospital, New York City, has been appointed nursing consultant, Health Education Division, New York Tuberculosis and Health Association.

HAVEN EMERSON, M.D.,* was given a Gold Heart Award, the highest honor of the American Heart Association, for outstanding contributions to the progress of cardiovascular medicine and the heart program at the association's recent annual dinner in Atlantic City.

JOHN F. ENDERS, Ph.D.,† associate professor of bacteriology, Harvard Medical School, Boston, Mass., has received the 1953 Passano Foundation Award of $5,000 in recognition of his work in the development of methods for culturing the poliomyelitis viruses in tissue.

IRVING A. FULLER, chief plumbing inspector, Sanitation Division, Colorado State Health Department, has retired after 26 years of service.

MARY GHOSTLEY, M.D., for the past 22 years superintendent and medical director of the Lake Julia Sanatorium at Puposky, has been appointed director of District Health Unit No. 1, Minnesota Department of Health, headquarters at Bemidji.

JACOB A. GOLDBERG, Ph.D.,* director, Social Hygiene Division, New York Tuberculosis and Health Association, received an Honorary Life Membership in the American Social Hygiene Association at the Annual Social Hygiene Day luncheon meeting on April 22.

DAVID GRIFFITH, health education consultant, Charleston-Kanawha (W.Va.) Health Department, has returned to his duties after 18 months as information officer with a Preventive Medical Section attached to the Eighth Army medical service in Korea.

DOROTHY HALL, assistant district supervising nurse in the Saranac Lake District, New York State Health Department, has been appointed director of nurses, Seneca County Health Department.

SHELDON J. HANEMANN has been appointed assistant to the chief of the Industrial Hygiene Section, Louisiana State Department of Health, New Orleans.

JOHN J. HANLON, M.D.,* until recently professor of public health practice, School of Public Health, University of Michigan, has been appointed Medical Director, Public Health Service, and director of health and sanitation of the Technical Cooperation Administration, U. S. Department of State.

JAMES J. HEALY,† former executive secretary, Lackawanna County (Pa.) Tuberculosis and Health Society, is now executive secretary of the Lake County (Ind.) Tuberculosis Association.

W. G. C. HILL, M.D., director, Marshall County (W.Va.) Health Department, has resigned because of ill health.

MILDRED L. HOLLIDAY, assistant district supervising nurse in the Utica District, New York

State Department of Health, has retired to study art and Spanish at the University of Mexico, Mexico City.

RUTH BORING HOWARD, M.D., M.P.H.,† after 25 months in the Near East as district medical officer, United Nations Relief and Works Agency for Arab Refugees, has been appointed chief, Hospital Standards and Consultation Section, Colorado State Health Department, to succeed RICHARD P. MACLEISH,† on leave for six months.

MARJORIE HYER, former special writer, Church World Service Department, National Council of Churches, has joined the staff of the American Physical Therapy Association (New York City) to direct its recruitment program.

S. W. JABAUT, M.D., a practicing physician of the state for 20 years, has become director of West Virginia's Health District No. 2 made up of Greenbrier, Monroe, and Pocahontas Counties, with headquarters in Lewisburg. He succeeds the late A. M. CARR, M.D.

ELEANOR E. LEPSON, R. N.,† associate consultant of the Health Division, Philadelphia Health and Welfare Council, has been appointed an assistant to the director of the Public Health Nursing Division, in charge of nursing education, Philadelphia Health Department. CLAIRE H. R. MERRILL, R.N., formerly supervisor, Hartford (Conn.) Visiting Nurse Association, has been made an assistant in program administration.

DONALD LOUGH,† senior sanitarian, Mingo County Health Department, and president of the West Virginia Public Health Association, has resigned to accept a position with the DeLaval Separator Company, Winchester, Va.

MARY MILLS, Public Health Service nurse officer and now chief nurse with the U. S. Point Four technical aid mission in Lebanon, has recently had her portrait added to the Harmon Foundation collection in New York, the thirty-third in a series of oil paintings of outstanding American Negroes.

JOSEPH G. MURPHY,† executive secretary of the Niagara County (N.Y.) Tuberculosis and Health Association has resigned to become executive secretary of the Anti-Tuberculosis Association of Summit County, Akron, Ohio.

NORMAN BARTRAM NELSON, M.D.,* dean of the School of Medicine, American University, Beirut, Lebanon, since 1951, and on leave as assistant dean of the College of Medicine, University of California at Los Angeles, has been named dean, State University of Iowa College of Medicine, Iowa City, succeeding the late dean, MAYO SOLEY, M.D.

MABEL T. NORTON, with the San Diego Department of Public Health for nine years, has been appointed chief of the Bureau of Public Health Nursing created in the newly consolidated San Diego City-County Health Department, Calif.

EUGENE P. PENDERGRASS, M.D., head of the Department of Radiology, University of Pennsylvania School of Medicine, Philadelphia, received the fifth annual award of the American Cancer Society, consisting of a medal and plaque, for distinguished service in the field of cancer control.

MARY E. REILLY,† formerly in charge of radio health education for the New York Tuberculosis and Health Association, is now consultant in community organization, Nassau County Tuberculosis and Public Health Association.

J. BEN ROBINSON, D.D.S., dean, Baltimore College of Dental Surgery, University of Maryland, has been appointed dean of the newly organized School of Dentistry, University of West Virginia, Morgantown.

SIR ROBERT ROBINSON, Waynflete Professor of Chemistry, Oxford University, Nobel Prize-winning chemist and internationally known authority on vitamins, hormones, and other natural chemical substances, has won the 1953 Priestley Medal of the American Chemical Society, the highest honor in American chemistry.

WARREN W. SCHLICKENRIEDER, former assistant district sanitary engineer in the Middletown District, is now district sanitary engineer, Saranac District, New York State Health Department.

S. C. SEAL, M.B., Ph.D.,* of the All India Institute of Hygiene and Public Health, Calcutta, has been promoted to headship, Department of Epidemiology, and professor of epidemiology.

MARTIN J. SOKOLOFF, M.D.,† chief of the Division of Tuberculosis, Philadelphia Department of Public Health, has been made director, Department of Diseases of the Chest, Jefferson Hospital, Philadelphia, Pa.

COL. MERVYN B. STARNES, D.V.M.,* recently returned from the Far East Command, has been assigned as staff veterinary officer in the Third Army Medical Section, Fort McPherson, Ga.

HAROLD WAINESS,† chief sanitary officer, Chi-

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* Fellow.
† Member.

cago Health Department, on leave from his duties as regional milk and food consultant of the Public Health Service, has resigned to enter private practice as a milk and food consultant, 228 N. LaSalle St., Chicago, Ill.

GEORGE W. WATSON,† who has been assisting with the Civil Defense Health Service of the Baltimore Health Department has been made nonmedical health administrator for the Western Health District which has moved to the old University of Maryland Hospital building, 601 West Lombard St. WILLIAM J. FRENCH, M.D.,* newly appointed health officer of the Southern Health District, is giving medical supervision.

CHARLES L. WILBAR, JR., M.D.,* president of the Board of Health, Territory of Hawaii, since June, 1943, has resigned to become deputy secretary of health, Commonwealth of Pennsylvania, Harrisburg.

IRVING S. WRIGHT, M.D., retiring president of the American Heart Association, was presented the Association's Distinguished Service Medallion at the recent annual dinner in Atlantic City.

DEATHS

ABRAHAM J. BROWN, M.D., M.P.H.,† medical inspector, Philadelphia Board of Education, on March 22 (School Health Section).

W. GRAHAM COLE,† assistant secretary in charge of safety bureau, Metropolitan Life Insurance Co., New York, N. Y., on April 12 (Engineering Section).

EDUARDO GARRIDO-MORALES, M.D., Dr.P.H.,* commissioner of health in Puerto Rico from 1933 to 1942, on April 8 at the age of 54 (Epidemiology Section).

GEORGE F. HADLEY, Ph.B.,† analyst, Division of Food, Pittsburgh Department of Public Health (Laboratory Section).

CLIFFORD H. JOPE, M.D.,† of San Francisco, Calif. (Health Officers Section).

ALCOR A. SHANKS † of Nassawadox, Va., on January 18 (Laboratory Section).

CONFERENCES AND DATES

American Public Health Association. 81st Annual Meeting, New York, N. Y., November 9–13 and Related Organizations including:

Administrators of Union Health Plans
Agricultural College Extension Health Education Specialists
American Association of Medical Record Librarians
American Association of Public Health Physicians
American Association of Registration Executives
American Board of Preventive Medicine, Inc.
American School Health Association
Association of Business Management in Public Health
Association of Maternal and Child Health and Crippled Children's Directors
Association of Reserve Officers of the U. S. Public Health Service
Association of Schools of Public Health
Association of State Planning Agencies
Commissioned Officers Association of the U. S. Public Health Service
Conference for Health Council Work
Conference of Municipal Public Health Engineers
Conference of Professors of Preventive Medicine
Conference of Public Health Veterinarians
Conference of State and Provincial Public Health Authorities of North America
Conference of State and Provincial Public Health Laboratory Directors
Conference of State Directors of Health Education
Inter-American Association of Sanitary Engineers
Military Government-Civil Affairs Public Health Society
National Advisory Council, Cleveland Health Museum
National Sanitation Foundation
Public Health Cancer Association

Coming in June, July, and August:

American Home Economics Association. Kansas City, Mo. June 23–26.
American Hospital Association. San Francisco, Calif. August 31–September 3.
American Library Association. Los Angeles, Calif. June 21–27.
American National Red Cross. Annual Convention. Washington, D. C. June 22–24.
American Pharmaceutical Association. Annual Convention. Salt Lake City, Utah. August 16–23.
American Physical Therapy Association. Baker Hotel, Dallas, Tex. June 15–19.
American Veterinary Medical Association. Annual Meeting. Toronto, Ontario, Canada. July 20–23.
American Water Works Association:
New Jersey Section. Summer Outing. Finderne. June 10.
Pennsylvania Section. Hershey Hotel, Hershey. June 17–19.

Amherst Health Conference. Massachusetts Public Health Association. Amherst. June 17–19.

Governor's Conference. Olympic Hotel, Seattle, Wash. August 2–5.

International Congress for Medical Librarians. London, England. July 20–25.

International Congress of Radiology. Copenhagen, Denmark. July 19–25.

International Congresses of Tropical Medicine and Malaria. Istanbul, Turkey. August 28–September 4.

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Massachusetts Public Health Association. Amherst. June 17–19.

National Education Association. Roney Plaza Hotel, Miami Beach, Fla. June 28–July 3.

National League for Nursing. Cleveland, Ohio. June 22–26.

National Medical Association. Annual Meeting. Nashville, Tenn. August 10–14.

New England Health Institute. Rhode Island University, Kingston, R. I. June 10–12.

Pennsylvania State Health Conference. State College, Pa. August 17–20.

Special Libraries Association. Royal York Hotel, Toronto, Canada. June 22–25.

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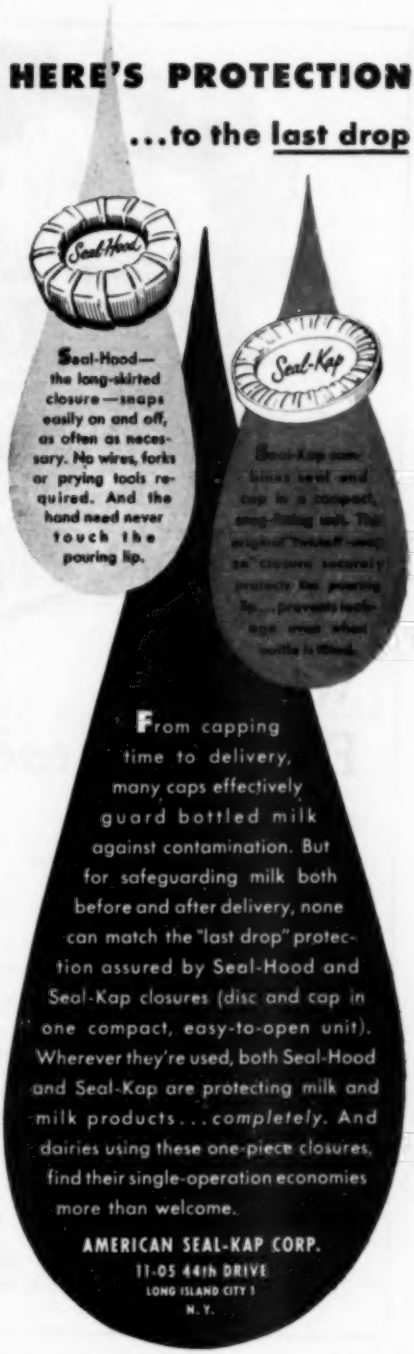
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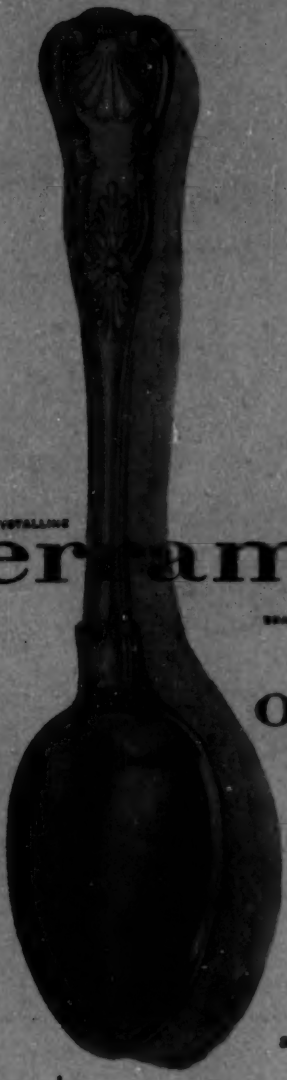

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